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FINAL REPORT

CONTRACT NO. DLA900-86-C-2045

on

CBR-D TACTICAL DECISION AID (DECAID)  
IDENTIFICATION AND ANALYSIS OF PREDICTIVE HUMAN  
PERFORMANCE MODELS AND DATA BASES FOR USE  
IN A COMMANDER'S CBR-D DECISION AID (DECAID)

to

U.S. NAVAL TRAINING SYSTEMS CENTER

October 15, 1988

by

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9. ABSTRACT (Continue on reverse if necessary and identify by block number)  Battelle, Columbus is in the process of developing the high-level function specification for the Navy Training Systems Center. The purpose of this training system is to provide naval officers with training on the effective conduct of tactical operations under Chemical/Biological/Radiation-Defense conditions. One of the areas of need is a review of existing models and data bases which might support the training system simulation. This document provides a review of the literature with an intensive review of the following models: Human Reliability, NURA, VENM, DAWN, Task Time Multiplier, PDGRAM, TCORE, CWTsar, NUSSE II, and TSARDOSE. Recommendations are provided for a Source/Path/Receiver methodology to incorporate the models. Human Performance Abstracts and Modeling Abstracts are also provided. <i>Reynolds; DECAID (Tactical Decision Aid), - See p 7</i>			
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## EXECUTIVE SUMMARY

### PROBLEM

Battelle is in the process of developing the high-level functional specification for a Commander's Chemical, Biological and Radiological Defense (CBR-D) Tactical Decision Aid (DECAID) training system. The purpose of this training system is to provide Naval officers with training on the effective conduct of tactical operations under CBR-D conditions. One of the areas of need for development of DECAID is the review of existing models and data bases which might be used to support the training system simulation.

### OBJECTIVE

This study was separated into two phases. The objective of Phase 1 was to provide the literature search for documents and the review and analysis of the models and data bases as described in the available documents. The Phase 2 objective was to determine which performance decrement models and/or data bases should be acquired, refined and supported for use in the DECAID training system.

### APPROACH

The following procedure was used to collect and review the applicable documents. The US Air Force maintains an automated bibliographical data base containing over 7000 documents relating to CBR-D at Armstrong Aerospace Medical Laboratory, Special Projects Office (AAMRL/HET) Wright Patterson AFB, Dayton, Ohio. The AAMRL Chemical/Biological data base was queried using the key words of MODEL, HUMAN PERFORMANCE DATA BASE and TRAINING. This resulted in the collection of over 900 abstracts dealing with all types of modeling efforts, some form of human performance, abstracts for various chemical defense data bases and chemical defense training. The bibliographic citations for all of the human performance and modeling documents are attached to this study as Appendices A and B. This will provide the researcher with supporting documentation for the development of other facets of a training system, if required. Other bibliographical abstracts not found in the AAMRL data base were acquired through a search of the Defense

Technical Information Center data base and all documents were ordered via the Chemical/Biological Information Analysis Center (CBIAC). The analysis of the models and data bases was performed based on the results of the literature review as well as discussions with subject matter experts.

## CONCLUSIONS

The following conclusions were made:

- Only a handful of models and data bases exist which are applicable to the DECAID program and no model currently exists which satisfies all the requirements of a decision aid for the Damage Control Assistant (DCA).
- The TCORE model, based on the work of Givoni-Goldman, can provide an estimate of the core temperature of the personnel working in the chemical defense ensemble.
- The chemical models which should be considered for inclusion into the DECAID model are NUSSE, TSARDOSE, VENM, DAWN, PDGRAM and selected portions of NURA or CWTsar.
- To develop DECAID will require modifications to the existing models in order to apply them to the training/decision aid environment.

## RECOMMENDATIONS

- Identify the input and output parameters (architecture) and the required format of the parameters for use by DECAID.
- Identify critical data essential to the DCA for data base support and implementation of the DECAID model.
- A prototype system of the DECAID model should be developed using the TCORE model to support modeling of MOPP level, heat effects and human performance.

## PREFACE

This document contains a series of abstracts related to the high-level functional specification for a Commander's Chemical, Biological and Radiological Defense (CBR-D) Tactical Decision Aid (DECAID) training system. The abstracts are categorized under the following classifications: chemical threat, human performance, heat stress, war gaming, data bases and reliability/time motion models. This report was prepared by Battelle, Columbus Division for the U.S. Naval Training Systems Center, Orlando, Florida under contract number DLA900-86-C-2045, Task 38.

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## 1.0 INTRODUCTION

### 1.1 BACKGROUND

Battelle is in the process of developing the high-level functional specification for a Commander's Chemical, Biological and Radiological Defense (CBR-D) Tactical Decision Aid (DECAID) (see Tijerina et.al., 1988) training system. The purpose of this training system is to provide Naval officers with training on the effective conduct of tactical operations under CBR-D conditions. Initially the DECAID system was to be designed for training Battle Force Commanders, Platform COs, or other senior officers to make tactical decisions in CBR mission situations. Instead, based on the actual need for training, the emphasis was shifted to the Damage Control Assistant (DCA), who is the focal point for all CBR-D operations aboard ship.

One of the steps to the accurate development of the DECAID is the requirement to review the literature for existing models and data bases which could be used to support the training system simulation. These models and data bases will be used to develop realistic training scenarios and provide the trainee with exercises which will familiarize the student with the activities required before, during and after chemical/conventional combat situations.

The objective of this study is to assist in the development of a decision aid trainer by reviewing models and data bases related to the chemical environment and recommending those models and/or data bases which are most applicable for use with the training system. It is anticipated that models of human performance and machine interaction applicable to CBR-D conditions will form a core component of the automated DECAID training system. Select data bases will be required to provide the information to support the selected models.

### 1.2 STUDY SCOPE

This study was separated into two phases. Phase 1 provided the literature search for documents and the review and analysis with a short description of each model or data base (Section 3 of this report). During Phase 2, determination of which models and/or data bases should be acquired,

refined and supported for use in the DECAID training system was accomplished (Section 4 of this report). Few models or data bases exist that are applicable to the specific problem related to CBR-D and the Naval on-board ship modeling of the combination of chemical threat and conventional combat situations. Another problem encountered was the access to specific unclassified/limited or classified documents. These were extremely difficult to obtain from the Defense Technical Information Center because of the recent espionage actions.

## 2.0 METHOD

### 2.1 STUDY DESIGN

The following procedure was used to collect and review the applicable documents. The US Air Force maintains an automated bibliographical data base containing over 7000 documents relating to CBR-D at Armstrong Aerospace Medical Laboratory, Special Projects Office (AAMRL/HET) Wright Patterson AFB, Ohio. The AAMRL Chemical/Biological data base was queried using the key words of MODEL, HUMAN PERFORMANCE, DATA BASE and TRAINING. This resulted in the collection of over 500 abstracts dealing with all types of modeling efforts, eighty-seven abstracts which considered some form of human performance, one hundred and twenty four abstracts for data base and over two hundred pertaining to training. Over nine hundred abstracts were reviewed. The appropriate were then selected and ordered from the Defense Technical Information Center. The bibliographic citations for all the human performance and modeling documents are attached to this study as Appendices A and B. This will provide the researcher with supporting documentation for the development of other facets of a training system, if required. Other bibliographical abstracts not found in the AAMRL data base were acquired through a search of the Defense Technical Information Center data base and all documents were ordered via the Chemical/Biological Information Analysis Center (CBIAC).

The procedure used for the review of the documents was based on the format developed in the work plan. This format consisted of the following areas of interest: chemical threat, human performance, heat stress, war game modeling and existing data bases including human reliability/time motion studies. Upon review of the documents and contacts with the authors, it was

discovered that very little has been accomplished for DoD in the area of validity of the models and data bases for chemical studies. In the domain of data bases, the data have been acquired using various methods without much concern for standardization. For example, the Air Force uses the Logistics Composite Model (LCOM) data base to access the times to perform tasks on the flight line. This is a maintenance data base, yet it also serves to support the modeling efforts of the Chemical Warfare Theater Simulation of Airbase Resources (CWTsar) used by the Air Force for chemical defense modeling. LCOM is an adequate data base for the model and it was cost effective to employ it to support the CWTsar model. It is limited in its capability, as are all data bases which were designed for one thing and applied to something else. This is one of the problems encountered when selecting models or data bases for new or different applications than what they were originally intended or designed.

There are a few ongoing programs for which documentation was not yet available. These are studies the US Army is performing on the psychological effects of the Chemical Defense Ensemble (CDE) and task studies of increased time to perform tasks due to the encumbrance of the CDE. The psychological studies (DELPHI) are being performed at Fort Rucker by Maj. Glenn Mitchell and task studies are being performed at the Army Research Institute by Chris Hartell.

One Army study of data base development is being conducted by Dr. Charles Wick at the Ballistic Research Laboratory. His work is centered around collection of correction factors for increased time to perform when wearing the CDE. These correction factors are used as a support data base (subroutine) for tasks in the AURA model. These factors are added to the original task time in the AURA data base to acquire increased time to perform tasks when wearing the Mission Oriented Protective Posture (MOPP) IV configuration (gloves, mask, hood, jacket, pants and boots) of CDE. These data bases are critical for understanding human performance in the chemical environment, but they may be difficult to apply to the development of a data base for the DECAID system because the information that the student will require is an assortment of different data bases containing many aspects of chemical threat and how to respond to that threat effectively and efficiently in the on-board environment. Some of the data bases developed for models used by the Army and Air Force, such as NUSSE II or CWTsar are more applicable to this development.

The selection of the models to support DECAID culminated with a detailed review of the models for incorporation in to the DECAID system as Section Four of this report. Some of the software arrived before publication of this document and others are still on order.

## 2.2 ORGANIZATION OF ABSTRACTS

The abstracts presented in Section Three are separated into five categories. These categories are Chemical Threat, Human Performance, Heat Studies, War Game Military Models, Data Bases, and a review of Human Reliability/Time Motion Study. The reviews contained in Section Three provide an overview of the areas of concern for selection of models and/or data bases that will support training of personnel. The listings of these reviews (Section 3) are presented in each of the five categories in alphabetical order by last name of first author.

## 3.0 ABSTRACTS

### 3.1 CHEMICAL THREAT MODELS

Birenzvige, A., 1983. A model to predict the threat of exposure to chemical warfare agents in enclosed spaces. Aberdeen Proving Ground, MD.

A model to calculate the concentration of a chemical contamination in an enclosed space has been developed. The model takes into consideration processes such as natural infiltration of air into the enclosure, forced ventilation, recirculation, filtration of the forced ventilation and recirculating air. In addition, the model considers deposition of contamination onto the various surfaces present indoors and for re-evaporation. It was shown that the factors most important in determining the indoor concentration are the rate of infiltration of air into the building, surface deposition, the capture efficiency or the contamination by the filtering/air conditioning system, and rate of desorption/re-evaporation of the contaminant. The indoor exposure dosage can be reduced significantly by increasing the ventilation rate after passage of the chemical cloud.

Blackstein, H.R. , 1986, Chemical Warfare ships ventilation model (VENM), US Army Proving Ground, UT.

This report presents a chemical warfare ship penetration model (CWSPM) designated VENM (for ship air ventilation model) incorporating the best features of other CWSPM models. VENM is a computer model used to predict chemical agent concentration and dosage histories inside a ship subjected to a hit by a penetrating chemical warhead or to a chemical agent cloud from an external source. The VENM model is coded in FORTRAN 77 and is available on disc from US Army Dugway Proving Grounds. A USER's manual, the FORTRAN code and a sample of the model output are provided.

Bleeker, D.E., 1984, A real time air dispersion modeling system. Sierra Geophysics, Redmond, VA.

This report documents a micro-computer based system for the real-time computation of toxic corridor associated with chemical releases. The program assists the user with interactive impact of meteorological parameters and accesses user-specified data bases of information regarding toxic chemical attributes. Graphic displays show the analyst the resulting toxic corridor superimposed upon site specified base maps. The program is documented for the user including the time and date of each calculation. The program is modular in design and will be modified and upgraded in the future.

Guess, A., Wallace, M. Yencha, T.J., Overman, M.E., (1988) Deposition and weathering of a chemical warfare attack on a naval vessel (DAWN), Naval Surface Warfare Center, Dahlgren, Virginia.

The DAWN model is a series of computer programs used in simulating the deposition and weathering effects of a chemical agent in a Naval environment. The entire model was designed as a series of modules, that can be replaced or modified as needed. There are eight modules which support this model. They are the data base generation, cloud tracking, agent deposition, agent evaporation, vapor generation, vapor tracking vent history and graphics display. This model is designed to run on a MICROVAX II microcomputer in conjunction with a Vectrix model 384A color graphics display system or a Tectronix 4125 graphics display terminal. The software is FORTRAN 77 or C language. The model can provide three-decisional graphics of the agent as it is

deposited on the vessel and of the agent as it evaporates off the vessel surface.

Johnson, M.. 1980, Methodology for chemical hazard protection. Dept. of Defense Explosive Safety Board, Alexandria, VA.

This paper describes a method for estimating hazard distances associated with hypothetical maximum credible events (MCE) from which toxic substances might be released into the atmosphere. In particular, the method is comprised of a mathematical model and complete set of input data representing appropriate parametric values for wide ranges of geographical and meteorological environments. Certain subordinate mathematical models are also provided to facilitate calculations when MCE includes either spills of toxic substances onto ground surfaces or plumes which ascend rapidly because of heat generated by fuel fires.

Kunkel, B.A., 1985, Development of an atmospheric diffusion model for toxic chemical releases, Atmospheric Sciences Division, Air Force Geophysics Laboratory, Hanscom, AFB, MA.

As part of an effort to replace the Air Force's Ocean Breeze/Dry Gulch dispersion model with a more state of the art model, a three-dimension Gaussian puff atmospheric model is being developed for predicting the dispersion of toxic gases resulting from a chemical release. The model is similar to the Shell Development Co. spills model but, includes several improvements. A continuous stability parameter is used instead of discrete Pasquill stability categories. The surface heat flux, friction velocity, Manin-Obukjov length and surface roughness are used to determine the stability parameter. There is also an option to use the standard deviations of the horizontal wind direction for computing the stability parameter. The computer code is written in Basic language for the 2100 microcomputer. Future improvement in the model will include incorporating the heavy gas effect and better methods of incorporating the heavy gas effect and better methods of defining the source strength.

Magee, R.C., J.C. O'Neal, T.Y. Yencha, 1984. Analysis of decontamination versus natural weathering of chemically contaminated U.S. Navy ships during military operations at sea, Naval Surface Weapons Center, Dahlgren, VA.

This study evaluated the effectiveness on the reliability of natural weathering versus the initiation and completion of full-scale mechanical decontamination procedures on chemically contaminated US Navy ships. The criteria for the decontamination processes are contained in this report.

Parks, W.G., P.W. Vaughan, 1983. Unit operations in conventional/chemical warfare, volume 1. DATSD (AE).

This report provides an evaluation of US knowledge of the impact that the addition of chemical munitions to attacks incorporating conventional weapons makes on US military units. It assess the general impact of combined conventional/chemical warfare on central European operations.

Replogle, C.R., Porter, C.D., 1985, Evaluating the CW challenge to air bases. Air Force Aerospace Medical Research Lab, Wright Patterson AFB, Dayton, OH.

This document provides discussions of the problems of operating in a chemical hazard from a fixed site location. A value of a military target must be known to assess the type and amount of challenge of a chemical agent. The target geometry, wind direction and speed, and area coverage must be calculated. The following are necessary to model the CW environment: 1. threat analysis, 2. meteorological data, 3. scenario development. Models used to develop these three areas are: NUSSE II and the Point and Area Chemical Effects Model (PACHEM).

R. Saucier. "A Mathematical Model of the Atmospheric Transport and Diffusion of a Chemical Contaminant." ARCSL-TR-81071, U.S. Army Armament Research and Development Command, Chemical Systems Laboratory, Aberdeen Proving Ground, Maryland.

NUSSE II is the second generation Non-Uniform Simple Surface Evaporation model developed by the U.S. Army. NUSSE II models the atmospheric transport and diffusion of chemical agent from bombs and tactical ballistic missiles (TBMs) using bulk release, and from munitions which use explosive dissemination. The program outputs provide liquid deposition, vapor

concentration and dosage patterns for a selected munitions. NUSSE II is a deterministic model; each model run predicts the expected value dissemination pattern of a single munitions for a single set of weather and delivery conditions.

Sloop, D.W., Whitacre, C.G., 1979. An analytical model for chemical weapons assessment (program 30 ABC/I1), Aberdeen Proving Ground, MD.

The model described in this report employs convolution techniques to compute the expected composite distribution resulting from a number of like contaminated patterns overlapping at random. The contaminated pattern is generated as a function of downwind distance and the resultant composite distributions are sampled in a manner which permits direct estimation of the casualty rate as a function of the distance from the upwind edge of the impact zone.

Skipniewicz, C.C. Schacter, G.E., 1984, Assessment of the performance of an in-field Gaussian plume/puff model for overwater use. Naval Postgraduate School, Monterey CA.

A chemical hazard forecast computer model was tested for consistency with field data which was used in its development. The chemical weapons hazard model is encoded in the BASIC programming language and is designed for use on the HP 9845B microcomputer. The models attempt to forecast puff dispersion, for which parameterization has not been developed from the (Naval Postgraduate School) NPS data sets. The parameterizations developed from the NPS data set are compared to an inadequately derived set of parameterization demonstrating the generic applicability of the model. It was found that the model predicts the total width over which a hazard might occur reasonably well but under predicts the downhill hazard distance. This is due to lack of separated consideration of meander effects.

Van der Holst, J.P.J., 1977, Alternative study on simulation and other military training aids for protection against the effect of chemical warfare, Chemisch Laboratorium, TNO, the Netherlands.

Document gives a survey of the chemical stimulants and the methods of dissemination already in use or being developed in different countries.

Recommendations are given in order to introduce a field training system for chemical defense to be used by the Netherlands (Dutch) forces.

Wu, D., Sloop, D.W., 1986. A package of transport and diffusion models for biological and toxic agents. Chemical Research Development and Engineering Command, Aberdeen Proving Grounds, MD.

Three mathematical transport and diffusion models (Gaussian, K theory, and Time Increment) for biological and toxin agents exclusively have been developed and documented along with user's guides to the computer codes.

### 3.2 HUMAN PERFORMANCE MODELS

Ainsworth, L., July 1971. Effects of a 48 hour period of sustained activity on tank crew performance. Human Resources Research Organization, Alexandria, Va.

This report gives the results of a 48 hour field experiment conducted to determine the effects of sustained activity on the performance of a tank crew in communications, driving, surveillance, gunnery, and maintenance activities. Moving, surveillance, and some driving activities showed statistically significant performance deterioration over a 48 hour period of work without sleep, but these decrements were not considered to be of practical significance. The experiment showed that the diurnal rhythm of the subjects did not affect performance significantly. The research indicates that changes in unit organization or tactical doctrine are not necessary to accomplish continuous operations. The results of the experiment support the broad conclusion that tank crews can maintain proficiency during 48 hours of sustained activity.

Allevini, B.A., 1983, Physiological Evaluation of Chemical Protective Clothing. Navy Clothing & Textile Research Facility, Natick, MA.

This document describes the use of the Mark III CW suit and Navy Mark V mask. This combination was studied in five different weather conditions. The Mark III with wet-weather gear caused tolerance time to decrease and was most stressful. The least stressful was the Mark III without the wet weather gear.

Carter, B.J., Cammermeyer, M., 1985, Biopsychological responses of medical unit personnel using chemical defense ensemble in a simulated chemical warfare environment, 352 Evacuation Hospital, Oakland Army Base, Oakland CA.

The major purpose of this article was to identify biopsychological responses personnel experienced when wearing the chemical defense ensemble at MOPP IV level. The biopsychological responses were those physical or psychological effects which a person relates when wearing the chemical defense ensemble. The study was designed to explore the relationship between demographic characteristics and biopsychological responses, between demographic characteristics and answers to open-ended questions regarding difficulty with the exercise and suggestions for the future. Sixty nine percent of the subjects reported developing biopsychological responses during the MOPP IV exercise. The most frequent responses were rapid breathing, shortness of breath, and loss of side vision.

Claiborne, J.D., 1979, Mathematical modeling of personnel degradation. Vol. I. background information and theory., Chemical Research and Development Engineering Command, Aberdeen Proving Ground, MD.

The purpose of this model is to calculate the personnel degradation suffered by military forces engaged in chemical warfare. Four potential sources of degradation are considered. They are skill inhibition due to wearing the protective clothing, decreased work/rest ratio due to the inability of the protective suit to dissipate heat, physiological effects of sublethal doses of chemical agents, and out to action time due to decontamination.

Cohen, Sheldon, 1980. After effects of stress on human performance and social behavior. University of Oregon.

A review of experimental and correlational studies of the after effects of stress on performance suggests that these effects occur as a consequence of a wide range of unpredictable, uncontrollable stressors including noise, electric shock, bureaucratic stress, arbitrary discrimination and environmental stressors. These effects are not limited to a restricted range of stressful situations that involve a lack of predictability and controllability over a stimulus, but they can also be induced by increased task demand. Interventions that increase human control and stressor predictability

are effective in reducing post stressor effects. There is also evidence for post stimulation effects on social behavior that generally involve an insensitivity toward other individuals following stressor exposure. Studies of exposure to environmental stressors in naturalistic settings report effects similar to those found in lab settings. Several theories are examined in light of existing evidence. Although some theories receive more support than others, it is suggested that the reliability of post stimulation effects occur in part because of a multiplicity of causes.

Davis, P.O., D.A. Hall, A.V. Curtis, 1983. Impact of MOPP equipment on physical performance requirements of U.S. Navy amphibious forces. Naval Civil Engineering Lab, Langley Park, MD. Institute of Human Performance, Langley Park, Md.

Members of the Institute of Human Performance and the Naval Civil Engineering Lab observed and documented the physical tasks associated with an amphibious battalion during Kernel Blitz 83. Selected members of the naval research group were outfitted in delta mission oriented protective posture (MOPP) equipment and asked to perform duties routinely required during operations of this type.

The results of this observation and documentation evaluation reveal the following key points regarding the performance degradation and impact of MOPP equipment:

1. The MK-3 suit had few adverse effects in the environment associated with Camp Pendleton during the month of March.
2. The MK17a mask will potentiate sea sickness in sailors previously immune to this disorder.
3. Prolonged (4-6 hour) wearing of the MK17a mask results in breathing distress in a number of sailors.
4. The fishtail boots become filled with water very easily, subsequently causing severe mobility problems.

Dixon, D.J., Copeland, M.G., Halcomb, C.G., Oct. 1980. Psychomotor battery approaches to performance prediction and evaluation in hyperbaric, thermal, and vibratory environments.

Historical overviews of psychomotor test batteries are presented. Discusses valuable data bases, none of the data bases culminated into a model of prediction of an individual's capacity to accomplish complex performance requirements. The discussion of psychomotor testing is interesting but the bibliography of heat effects performance is inadequate.

Draper, E.S., Lombardi, J.J., 1986. CANE FOTE Summary Evaluations Report, Phase 1. U.S. Army Chemical School, Fort McClellan, Alabama.

This interim report provides the results and analysis of Phase 1 testing of combined arms in a nuclear chemical environment (CANE) conducted at Fort Hunter-Liggett, CA, March through May 1983. This report provides an evaluation of the ability of the combined arm forces to operate for sustained periods of time on the integrated battlefield. The source of the data was a series of force-on-force trials involving mechanized infantry platoons against a Red Force employing current threat doctrine and tactics. Issues evaluated were close combat heavy (i.e. tank, large artillery), command and control, communications fire support, air defense, combat support, and battlefield theater nuclear warfare.

Emurian, H.H., 1979. A multiple task performance battery presented on a CRT. Office of Naval Research. Organizational Research Program.

A minicomputer controlled battery of tasks which can be presented individually or in combination with a single peripheral device, a CRT which uses the accompanying keyboard as the operator's console. The battery is composed of the following 5 tasks which represent major dimensions of complex performance: 1. probability monitoring, 2. arithmetic operations, 3. target identification, 4. warning light monitoring, and 5. blinking light monitoring. This system shows that a computer based CRT display facility can provide in a single instrumental complex, all of the advantages of several separate packages found in assessment batteries, and more importantly, add a flexibility of input and output control that has never been possible before.

Hammerton, M., Tickner, A.H., 1968. An investigation into the effects of stress upon skilled performance. Medical Research Council.

An account is presented of an investigation of the effect of an anxiety producing situation, namely the imminence of a parachute jump, upon skill in an acquisition tracking task. Parachutists at three levels of practice were examined: 19 experienced Army men, 9 Army trainees, and 16 territorial Army trainees, who were more affected than the experienced Army men, who were not affected at all. It is concluded that anxiety does produce a decrement in tasks of this kind, although such decrements can be minimized by appropriate training. It is suggested that an investigation into the best form of such training might be well worthwhile.

Hamilton, B.E., L. Zapata, 1983, Psychological measurements during the wear of the US Aircrew chemical defense ensemble, Fort Rucker, Al.

The psychological effects of wearing a US air crew chemical defense ensemble were evaluated. Half of the males and females wore the chemical defense ensemble while the rest wore standard US flight suits. All subjects were administered tests of cognition before and after 6 hours of wear in a controlled environment. The most serious impact of the ensemble was a decrease in morale among females.

Hancock, P.A., 1986. Stress information flow and adaptability in individual and collected organizational systems. Univ. of Southern Calif.

The central theme of this brief paper is the comparison of the commonalities between the characteristics of individuals and the collective organizational structures which they operate. Each entity collects, filters, and sequentially transduces information in this context is distinguished along two axes which represent flow rate and utility. Each entity seeks to locate itself within this two dimensional information space at a point which maximizes task related output at the least energetical cost consistent with successful performance. The transition between normal and failure modes of operation are compared across the human and the organization and can be represented as either gradual degradation or rapid dissolution of adaptability that can be described through the tenets of Catastrophe Theory.

Hartman, B.O., 1976. Higher mental functioning in operational environments. The Aerospace Medical Panel Specialists Meeting, Brooks, AFB, TX.

There is a general agreement among military behavioral specialists that operational stress affects higher mental functions more than simpler levels of perceptual motor behavior. A number of piloting as well as non-piloting jobs are vulnerable to this source of performance impairment. In general, laboratories are studying behavior at the more complex level. The specialists meeting was divided into two half day sessions, one on current studies and the other on required methodology and present deficiencies. This publication includes 11 papers which were presented at Ankara, Turkey, on 21 Oct. 1975.

Kupstein, F.F., A.I. Seigel, L.B. Wilson, H. Ozkaptan, 1979. Human performance in continuous operations: Vol II management guide. Manpower and Educational Systems Area.

Guides are presented for the management of human resources related to maximizing unit effectiveness during continuous operations. Concrete ground rules for personnel management are presented with respect to continuous operations. Steps to take prior to actual combat are given along with methods for controlling performance degradation during continuous operations. Projected soldier effectiveness as a function of battle length and type of unit are presented.

Ozkaptan, H., 1981. Human performance in continuous operations: descriptions of a simulation model and user's manual for evaluation of performance degradation, Applied Psychological Service Inc., Wayne, PA.

User instructions and reference materials are presented for a computer simulation model which analyzes the performance effectiveness of combat troops. The model allows analysis of anticipated performance effectiveness when variables such as continuous time in battle, light level, terrain advantage, and amount of sleep. The model is designed for interactive operation at a terminal by a user with no or minimum computer sophistication in computer science or use. The primary output of the model is tables of personal effectiveness degradation by day, type of combat unit, and each of five other combat factors.

Parker, D.T., Stearman, R.L., Montgomery, J.R., 1987. Assessment of performance of tasks by personnel dressed in chemical protective clothing. Technical Analysis and Information Office, U.S. Army Dugway Proving Ground, Dugway, UT.

Two programs at U.S. Army Dugway Proving Grounds assessed the performance of military personnel in personal chemical protective gear, as compared to performance in standard clothing. Maintenance tasks assessed included field maintenance of a tank and associated equipment and of a machine gun and a circuit board. Also, mission operations were conducted by an armor unit, a missile unit, a night reconnaissance unit and a signal unit. Overall performance degradation was 20 to 30 percent for troops operating in protective gear as compared to operating in standard clothing. For some tasks no degradation was found. Improvement in performance was often observed with repetition of task. There were also numerous wearability problems associated with the chemical protective gear.

Ramirez, T.L., R.L. Shew, J.E. Felt, M.E. Rayle, 1986. A method for determining task time increase caused by the individual protective ensemble. Harry G. Armstrong Aerospace Medical Research Laboratory, Dayton, OH.

The purpose of this report was to present a methodology developed to measure task performance in a constrained environment or the side effects of pretreatment/antidotal drugs. This methodology has potential use in a number of human performance measurement areas involving increased time to complete tasks as a function of changes in the usual job environment. With moderate adjustments to an algorithm developed for this study, performance analysts can adapt this method to calculate time changes for other degraded job/task environments which exhibit similar characteristics seen in a constrained environment.

Schneider, W., Schiffrian, R.M., 1977. Controlled and automatic human information processing: 1. Detection, search, and attention., 2. General theory. Univ. of Calif., Berkeley; Univ. of Indiana.

Presentation of quantitative models of search tasks using reaction time measures and the results of attention tasks using accuracy measures. Models are: 1. Serial, terminating for controlled search; 2. Mean reaction

time. Methods for developing prediction models for controlled-search models are provided as well as a framework for processing in detection, search, and attention tasks.

Simonson, E., 1976. Psychological aspects and physiological correlates of work and fatigue. Charles C. Thomas Publisher, Denver, CO.

Document is a literature review in the area of fatigue. Topics discussed are: the origin of the fatigue concept, fatigue and impairment, and kinds of fatigue.

Tharion, L.J., Rauch, T.M., Munro, I., Lessier, L.E. Bandaret, 1986, Psychological factors which limit the endurance capabilities of armor crews operating in a simulated NBC environment. U.S. Army Research Institute of Environmental Medicine, Natick, MA.

Factors which limit the performance capabilities of sustained armor operations in simulated conventional and chemical warfare environments were studied. In the simulated chemical warfare environment, extreme symptom and mood changes resulted in medical casualties, combat ineffectiveness, and early termination of all testing. Significant personality differences existed between casualties and survivors. The majority of casualties voluntarily terminated operational duties because of intense symptoms associated with wearing the chemical defense protective mask and clothing system. These symptoms were manifestations of respiratory and thermal stress.

Van Nostrand, S.J. 1986, Model Effectiveness as a function of Personnel. US Army Concepts Analysis Agency, Bethesda, MD.

Analysis of the need for human performance in the large combat models found that no model does a good job of implementing human performance to date yet it is very important and necessary. Performance degradation is being implemented into the combat models for the Army, such as the Force Evaluation Model (FORCEM) and the Vector in combat models.

Welford, A.T., 1973. Stress and performance. Univ. of Adelaide, South Australia.

The effects on performance are discussed for various types of stress deriving from imbalance between capacity on one hand and, on the other, the demands of tasks, environmental conditions and social situations which either overload or underload the individual. Common cybernetic principles seem to apply over an area which includes not only stress, but also motivation and arousal. A model is proposed which ties together three previously existing models current in the field: the inverted U hypothesis, signal detection theory, and the Yerkes-Dodson Law. The model is exercised further in relation to individual differences of personality.

### 3.3 HEAT EFFECTS ON HUMAN PERFORMANCE

Abarkhanzadeh, F., Ramsey, J.D., 1987. The prediction of temperatures and heat stress limits in the workplace with natural ventilation. Dept. of Industrial Relations, Los Angeles, CA.

This paper presents a simple procedure for using the climatic factors reported by the weather bureau to predict levels of heat stress and conditions of risk in the workplace. For an aluminum reduction plant with natural ventilation, the study showed that the air temperature inside followed the same pattern of annual changes as the normal maximum outside the building. The wet bulb globe temperature was correlated with air temperature outside the building. The wet bulb globe temperature was correlated significantly with air temperature. With limited measurements, wet bulb globe temperature was predicted for the entire year at different locations in the shop.

Bell, C.R., Provins, K.A., Hiorns, R.W. Visual and auditory vigilance during exposure to hot and humid conditions. London School of Hygiene and Tropical Medicine, London England.

The effects of exposure to climatic conditions ranging in severity on the performance of a visual and auditory vigilance task was studied separately in two series of experiments on fit young men. Exposure time decreased with increasing climatic severity. When performance was examined in terms of the proportion of signals missed to signals given there was no evidence of a change

in vigilance with different climatic conditions; but in both experimental series, a greater proportion of signals was missed as body temperature increased.

Freivalds, A., 1987. Development of an intelligent knowledge base for heat stress evaluation. Dept. of Industrial and Management Systems Engineering Pennsylvania State University, University Park, Pennsylvania.

An intelligent knowledge base system for heat stress evaluation is described. The evaluation of heat stress is a particularly difficult problem, utilizing a variety of sometimes contradictory heat stress indices, and thus is naturally suited for computer aided design. The present system uses an expert system approach and can be used either as a stand alone design tool or as one of the lower level models for larger ergonomic expert systems such as ALFIE. Simulations of a variety of environmental conditions were performed. A large diversity in predictive capabilities was found, depending on the assumptions used for each component index.

Givoni, B., Goldman, R.F., 1972, Predicting rectal temperature response to work, environment and clothing, *Journal of Applied Physiology*, Vol. 32, No. 6.

Formula's based on a biophysical model were developed which predict the time pattern of rectal temperature response to work based on environmental conditions and clothing properties. The formulas involve the metabolic heat production, ambient climatic conditions and total thermal resistance with evaporative coefficient of the clothing. This model best describes the human in response to the military field environment, especially when wearing the chemical defense ensemble and is the basis for most of the heat models that are used today.

Pfaff, D., 1968. The effects of temperature and time of day on time judgments. *Journal of Experimental Psychology*, 1968, Vol 76, No. 3. 419-422.

Normal circadian variations in body temperature were used to test Hoagland's conclusion based on artificial temperature variations, about the effect of body temperature on time judgments. Subjects produced instructed time intervals faster and overestimated the length of presented time intervals during the afternoon, when their body temperature was highest. These

variations support Hoagland's conclusion that subjective time judgement depends partly on an internal clock which accelerates when body temperature is raised.

Pandolf, K.B. Prediction modeling of physiological responses and human performance in the heat, 1986, US Army Research Institute of Environmental Medicine, Natick, Ma.

USARIEM had developed the predictive physiological models to represent rectal temperature, heart rate, sweat loss, energy expenditure, state of acclimatization and solar heat load. The data bases for these models as well as ones for physical fitness, gender and hydration levels have also been developed. The model also deals with the interaction of; a) theoretical physics, b) biophysics of clothing, c) the metabolic heat production, and d) meteorological considerations. Outputs of these models are work/rest cycles, work time and hydration level. The model provides reliable and valid results for protective clothing. Documentation includes a User Manual. The model can be run on a hand-held calculator.

Rohles, F.H., Konz, S.A., Krohn, R.J., 1982. Decision making under thermal stress. Kansas State University, Manhattan KA.

This report contains an annotated bibliography of the research on the effects upon behavior of the stressors of temperature, crowding, sleep disturbances, panic stress, and anxiety. In several searches of the literature a total of 900 articles were identified, from these 113 were selected as being critical to the human response in the survivable shelter environment. These, together with 36 studies on fallout shelters are reviewed. In addition, a survey was conducted which identified 93 problem areas for the survival shelter occupant. These fell equally into three main categories, survival shelter, personnel, and environment.

Stolwijk, J.A.J., 1971, A mathematical model of physiological temperature regulation in man, John Pierce Foundation Lab, Yale University School of Medicine, New Haven, Conn.

This model was developed for the National Aeronautics and Space Administration to use for predicting heat/cold effects on the body of astronauts. It is a 25 node representation of the body. Four nodes each for

the head, trunk, arms, hands, legs, and feet and central blood (25th node). It uses metabolic heat production based on convection, radiation and evaporation. It uses metabolic heat production based on convection, radiation and evaporation. Documentation includes FORTRAN 77 code with users manual.

Wissler, E.H., 1964, A mathematical model of the human thermal system, Dept. of Chemical Engineering, University of Texas.

This paper describes a mathematical model developed to simulate the physical characteristics of the human thermal system in the transient state. Physiological parameters such as local metabolic heat generation rates, local blood flow rates and rates of sweating, must be specified as input data. Automatic computation of these parameters were built into the model to study thermal regulation in the human. The program has been carefully checked for errors and is still in use today to analyze some heat stress problems of interest for the Air Force.

Witten, L., Comments on mathematical models for thermoregulatory behavior, NIOSH, Cincinnati, OH.

This document is an introduction to the use of mathematical models of the human thermoregulatory system. Models are expected to be useful in setting heat stress standards of the future in field assessment of hot environments, in design of work situations, and in physiological research. A short summary of the range of existing models is given. This is followed by a discussion regarding their usefulness and by a suggested program of research.

### 3.4 WAR GAME MODELING

Bapistella, O.H., 1981. Concepts of combat modelling for long range air armament planning and their implementation in the tactical air warfare analysis game. Naval Postgraduate School, Monterey CA.

This thesis describes the conceptual background and the major problems encountered in force structure planning. The model structure of the tactical air warfare analysis game (TAWAG) is reviewed and improvements and enrichments are proposed. Based on experience for trying to implement this

model on the computer of the Naval Postgraduate School, the author makes some recommendations to improve the transferability of models.

BDM Services Company, 1975, Techniques for war game assessments of chemical operations, Final Report, Vol I, Dayton, OH.

The purpose of this study was to provide sub-models for a computer assisted war game for unit chemical warfare. This is volume one of a two volume study. This volume explains the analysis structure, results of the computer runs, chemical casualty assessment model, heat casualty assessment and chemical barriers description. No lab or field data were available at the time of this writing to support the model development. The original degradation model was developed by project Summit and later incorporated into a battalion level simulation called Tech Sector. This evolved into the DEGRADE model. This model predicts degradation in unit mission effectiveness that is quite severe and is not supportable by any troop test or field experiment available at that time (1975). The Heat Casualty Assessment (HECAS) is an extension of the Givoni/Goldman model and is used to translate heat build up into heat casualties.

Dillard, D.A., 1983. Representation of Tactical Knowledge, Naval Electronic Systems Command, Portsmouth, VA.

This paper describes new progress in the design of data fusion techniques. Emphasis in the latest work is on the sharing of knowledge by cooperating subsystems of a C3 system and the representation of complex concepts. Methods of interfacing and integrating fusion processes are discussed. Other issues addressed are the subdivisions of memory for different factor and user assisted fusion.

Dillard, R.A., (1984) Research Needs for Artificial Intelligence Applications in Support of C<sup>3</sup>, NOSC-TR-1009, Artificial Intelligence Branch, San Diego, CA for Naval Electronic Systems Command, Washington DC.

This document presents a discussion of data fusion techniques. Topics considered include networking, communications networks, natural languages, tactical inferencing, problem solving, and data base updates.

The work is oriented to specific naval applications such as tracking of enemy ships and navigation.

Guirreri, J.A., 1986. Catalog of wargaming and military simulation models. Organization of the Joint Chiefs of Staff, Washington DC.

The 10th edition of the catalog of wargaming and military simulation models lists the description of over 600 simulations, wargames, exercises and models in general use throughout the Department of Defense and in the Defense Establishment of Australia, Canada, England, and Germany. The entries in the catalog are listed alphabetically by acronym and long title. A second index categorizes the entries by type and application. The description of each model includes: proponents, developer, purpose, general description, limitations, hardware, and additional information. The catalog draws upon input from analysis agencies in the various defense establishments, independent contractors and research organizations and similar catalogs of games and simulations. The inclusion of a specific model in the catalog was at the discretion of the proponent and does not constitute endorsement of the model by the Joint Chiefs of Staff.

Hassler, C.C. 1983, A simulation of information load and its affect on tactical decision making. Naval Postgraduate School, Monterey, CA.

The intent of this research was to provide a more realistic depiction of information usage by simulating the effects of various levels of information load on the choice process. This thesis examines the problems associated with the abundance of information generated by decision aids and utilizes James G. March's model of organizational/decision making as a medium to examine information. The emphasis is on choice situations resulting in "flight", "oversight" and resolution conditions and how the related provisions of information load prejudice the above mentioned conditions.

Kerlin, E.P., Moody, D.C., Schmidt, L.A., 1977. The IDA tactical warfare model: a theater level model of conventional, nuclear, and chemical warfare. Studies, Analysis, and Gaming Agency, Arlington, VA.

The IDA Tactical Warfare Model is a fully automated combat simulation that can be used to assess the interaction of forces employing conventional,

nuclear, and chemical weapons in a theater wide campaign. This volume completes the documentation of the TACWAR model with the chemical model logic and a detailed description of the computer aided program.

Leal, Antonio, 1982. Evaluating the effectiveness of military decision support systems: Theoretical foundations, expert system design and experimental plan, Santa Monica, CA.

The main objective of this program is to construct a flexible test bed for the evaluation of the effectiveness of computer based expert systems in military training and planning. The technical approach consists of simulating the characteristics of expert systems in a game-like environment. Such characteristics include: 1) friendly and English-like (stylized) dialogue, 2) system explanation of rationale about decision recommendations, 3) an Ability to make relevant suggestions and comments about situation assessment and about plans proposed by the user and 4) the user of high level strategic concepts and terminology. The required software for such a program includes: 1) a game environment simulator, 2) a simulated expert system for the game, 3) an evaluation program for recording execution histories and summarization. The game simulator will contain pros and cons for the experimenter to adjust critical parameters so that a controlled environment can be maintained. The expert system will monitor the progress of the game and can be interrogated as the user sees fit. A facility will also be provided for evaluating the users performance under different modes of consultation with the expert system.

McDaniel, J.W., 1976, Computerized Biomechanical Man Model. AAMRL, Dayton, OH.

The computerized Biomechanical Man-model (called combimann) is a computer interactive graphics technique for workplace design. This model allows a designer, sitting at a CRT, to manipulate a three dimensional male form of variable anthropometry and to design a workplace around him by means of a light pen. While originally included for aircraft design and evaluation, the general format of the model is suitable for consideration of virtually any workplace configuration and can be used to evaluated existing or theoretical workplaces with equal ease and precision.

Sauter, D.P., 1986, A real time decision aid for army aviators in a chemical warfare environment. US Army atmospheric sciences laboratory.

Document describes a model which computes the evolving hazard dimensions resulting from single or multiple chemical munitions burst for a hazard volume is adequately described over the interval of interest. The model runs on the ALBE Test Bed and on IBM PC compatible machines.

Tyson, W.M., 1984. Adaptive modeling and real time simulation, Rome Air Development Center, New York.

This is the final report covering progress on a two-year research effort towards the development of basic technology for adaptive modeling and real time computer simulation to support decision making in a number of critical planning situations that arise during the execution of tactical air missions. Both tactical and defensive planning must be done quickly--the side chat is faster and better prepared will have the advantage. Still, plans must be accurate. Planning too quickly may cause important information to be overlooked--information that may affect whether the true plan will achieve its intended goal. Computers should be able to support decision making and planning, but currently, for a number of reasons they do not approach their potential use in this field. One major reason is that under-standing of planning and modeling of real world situations are inadequate. These in-equa-cies involve: world models; a model of time; understanding of in-accurate information; propagating the effects of information and retracing that propagation if necessary; and processing speed, as regards deduction and simulation.

### 3.5 .TA BASES

Asplund, S.E., Et al., (1984) Simulation of Area Weapons Effects Best Technological Approach for Nuclear/Biological/Chemical Training Systems, PM Trade-7070-43-Vol 1, Department of the Army, Washington, DC.

This report recommends the Best Technological Approach (BTA) for development of Nuclear/Biological/Chemical (NBC) training devices as part of the Simulation of Area Weapons Effects (SAWE) project. The goal was to provide the realism necessary for effective training, with the ultimate goal of

significantly reducing battlefield casualties. This report summarizes the SAWE project and the NBC BTA task. It also contains the conclusions and recommendations which resulted from the task.

Asplund, S.E., Et al., (1986) Simulation of Area Weapons Effects Best Technological Approach for Nuclear/Biological/Chemical Training Systems, PM Trade-7070-43-Vol-2, Department of the Army, Washington, DC.

This is Volume 2 of a 3 volume report on the Best Technological Approach (BTA) for the simulation of Nuclear/Biological/Chemical (NBC) training devices as part of the Simulation of Area Weapons Effects (SAWE). The project goal is a realistic simulation of NBC effects for force-on-force training exercise. This volume provides study background information, methodology, and BTA for each system element. It is oriented towards Army organizations. Chemical training considers both persistent and non-persistent agents. Integration of the Chemical Agent Monitor (CAM) with the Jet Propulsion Laboratory (JPL) Persistent Chemical Agent Simulant (PCAS) is discussed.

Bailey, C.E., Pepper, D.W., (1981) Status Report on DOE-Sponsored Meteorological Model Validation Program. E.I. Du pont De Nemours and Co., Savannah River Laboratory, Aiken, SC for Department of Energy.

This report discusses the data base, calculational grid, calculational time periods and analysis of results needed for the meteorological model validation program. The data consist of integrated KR-85 air concentrations measurements and meteorological data taken at several sites in the general area of the Savannah River Plant. The grid results will allow the effect of wind speed and direction to be estimated. Weekly samples and ten-hour samples were collected for the various time periods considered. The results will be analyzed using standard statistical techniques.

Erickson, D.L., Ickler, J.F., McKeown, P.E., Metzger, I.J., Plock, R.J., (1984) Nuclear Environments and Effects Research for the National Training Center, Volume II - Chemical Warfare Concept Science Applications International Corp, La Jolla, CA for Defense Nuclear Agency, Washington, DC.

Comprehensive document which defines chemical warfare training requirements, formulates concepts for such training, and describes preliminary

simulation and computer methods for implementing concepts. Report emphasizes a data base of training situations. Large part of methodology and recommendations are based upon a review of nuclear warfare training study.

Erickson, D.L., Et Al., (1984) Integrated Battlefield Effects Research for the National Training Center, Appendix B: Requirements Design Specification for the Addition of Nuclear and Chemical, DNA-TR-85-13, Defense Nuclear Agency (DNA), Washington, DC.

Appendix B contains the requirements design specification for the addition of nuclear and chemical effects into the integrated battlefield training system at the US Army National Training Center. Contents include: functional requirements, software design requirements, interactive display and control component overview, nuclear and chemical effects algorithms.

Attachment 2 contains the algorithms used for calculating the chemical environment in the model.

Flowers, J. J., and Kovatch, D. H., (1984) Aircraft Combat Damage Repair Estimating Procedures Phase II, Development of Repair Time Estimator and Data Base, Final Report, ASD(XRM)-TR-83-5011, Air Force Aeronautical Systems Division, Wright-Patterson Air Force Base, OH.

Develops a repair estimator model to evaluate the survivability and repairability of existing inventory aircraft and conceptual designs. Standard and non-standard repairs were generated for each combat damage significant item as a function of damage assessment and repair concept. Contains a task time degradation factor for all work unit codes for the A-7D, A-10A, F-4E, F-15A, F-16A. These task time degradation factors were developed from observations of a "24-hour Air Battle Damage Repair (ABDR) exercise in which the personnel wore the suit and boots (MOPP 3) all the time and the mask and gloves about three hours on and off throughout the exercise. Based on this exercise and discussions with numerous ABDR personnel, CB warfare degradation factors were developed and implemented in the data base". States that "the model gives a worst case scenario assuming all repairs are performed in full CB gear".

Griffin, D.C., Dowler, W.L. and Ferraro, N.W., (1986) Simulation of Area Weapons Effects Nuclear and Biological Scenarios, PM Trade-7070-45, Department of the Army, Washington, DC.

The Nuclear/Biological/Chemical (NBC) scenarios relate current Best Technological Approaches (BTA) to NBC training simulation with Army Training and Evaluation (ARTEP) missions and NBC common module tasks to define training device technical parameters, tasks, conditions, and standards are described for squad through battalion elements. Training activities, devices and functions are identified with technical parameters and requirements.

Hoffman, M.D., Shprentz, J.S., Whitehead, J.M., Neuswanger, C.P., and Legere, J.F., (1984) Exercise of the computer model for bomb damage repair times, Volume I of II, ESL-TR-83-57, US Air Force Engineering and Services Center (AFESC), Tyndall AFB, FL.

This report documents extensive exercise of a computer model for Bomb Damage Repair (BDR) times developed to support the Rapid Runway Repair (RRR) program. The model is a constrained resource scheduling model that uses a resource allocation heuristic and a large data base of information about RRR equipment and procedures to produce a RRR activity schedule. This report presents results of sensitivity analysis. A test analysis of a multiple-crater model is also presented.

Lamarche, R., Robinson, D., Gornto, C. (1986). TSARINA Bare Base and Generic Cob Data Base Documentation, Orlando Technology Incorporated, Shalimar, FL for the Pentagon, Washington, DC.

This publication documents TSARINA (Theater Simulation of Airbase Resources Inputs using Airbase Damage Assessment) Bare Base and COB (Collocated Operation Base) control variables and target data, translates the data base codes to their English equivalents and presents graphic network models to facilitate its use by modelers and analysts.

**Leal, A., (1983) Evaluating the Effectiveness of Military Decision Support Systems: Theoretical Foundations, Expert System Design, and Experimental Plan**  
**Integrated Sciences Corporation, Monica, CA for US Army Research Institute for the Behavioral and Social Sciences.**

This document discusses a model for evaluating the effectiveness of computer based expert systems in military training and planning environments. The theoretical foundation for the model and a sample expert system are presented. An experimental design to test the effectiveness of the sample expert system is also provided.

**McCaughey, J. Garrick, J.B. Kelly, 1986. Combat casualties in a conventional and chemical warfare environment. Naval Health Research Center.**

A surgical data base describing the wounds of 2021 battlefield casualties, constructed with data from between June and January 1968. The Naval Support Activity Hospital, Danang, South Vietnam, was used in this analysis. Wound descriptions that would be expected to cause ventilatory interference or failure of the mask to seal against the face were identified. Soldiers having any one of these wounds were included in the protective mask failure group. Using these criteria outlined above, it was predicted that 34% of the casualties requiring hospitalization would not be able to use the protective mask effectively due to wounds from conventional weapons and this could result in additional death, incapacitation or complications in treatment depending on the effect of the chemical agent.

**Rakaczky, J. A., (1981) Effect of Protective Clothing on Combat Efficiency, AMSAA-TR-313313, Army Material Systems Analysis Activity, Aberdeen Proving Ground, MD.**

This report describes the first stage in the development of a computer simulated data base for the degradation of various military tasks. Time degradations are generated using models which incorporate heat stress. These models describe time increase for various tasks and workloads at different temperatures while in MOPP IV (full protective gear). Many of these Army tasks are applicable to Air Force tasks, both aircrew and ground crew.

Soergel, C.D., Rayle, M.E., Wick, C., Ramirez, T.L. (1987) Performance Estimates for Operators Conducted While Wearing Individual Protective Equipment: User Manual, Volume II. U.S. Army Ballistic Research Laboratory, Aberdeen Proving Ground, MD.

The purpose of this document and the accompanying data base was to provide additional improvements to the Army's Performance Data Base System. Volume Two provides improvements to the options of displaying correction factors by task and human abilities. Secondly, it allows for the introduction to development and implementation of the scenario option. The document presents the methodologies used for the integration and standardization of Air Force terms to the initial Army performance data base structure. Also included are the instructions for data base use.

Strauch, R. (1982) Battle Simulation for Command and Control Training, RAND/P-6769, The Rand Corporation, Santa Monica, CA

This paper presents the author's views on the development of Tactical Force Management Training and Analysis Facility (TFMTAF). The author claims that current computerized combat models are inadequate. This suggests that a hybrid model coupling a human control team with a computer data base system be used in the TFMTAF.

### 3.6 HUMAN RELIABILITY

#### Human Reliability

Titles: Various. See Description below.

#### References:

Bell, B., Nicolosi, S., Treaster, D., Rose, S., & James, Z. (1988). Human reliability data bank survey. Columbus, OH: Battelle Columbus Division.

Topmiller, D., Eckel, H., & Kozinsky, E. (1982, December). Human reliability data bank for nuclear power plant operations, Volume 1: A review of existing human reliability data banks (Report No. NUREG/CR-2744/1 of 2). Columbus, MD: General Physics Corp.

Swain, A., & Guttman, H. (1983, August). Handbook of human reliability analysis with emphasis on nuclear power plant operations (Report No. NUREG/CR-1278). Albuquerque, NM: Sandia National Laboratories.

Human reliability analysis (HRA) is a method to assess the probability that a person correctly performs some system-required activity in a required time period (if time is a limiting factor) and performs no extraneous activity that can degrade the system (Swain and Guttman, 1983). Attempts have been made to build data bases which support such analysis; these include the AIR Data Store, Bunker-Ramo tables, Aerojet General methods, TEPPS, and OPREDS. Based on the review by Topmiller, et al. (1982), these data bases will be described below.

#### AIR Data Store.

The American Institute of Research (AIR) Data Store, published in 1962, was constructed by Altman and his colleagues at the American Institute for Research. Its reliability estimates were to be used with the Index of Electronic Equipment Operability. Equipment components (e.g. display and controls) applicable to specific, measurable operational tasks were identified and categorized within a general framework of characteristics specifying the inputs, mediating processes and outputs of the operator. Altman and his associates searched several thousand research reports for data which could be used to estimate the effect of design on performance. They found usable data in 164 reports. General and experimental information pertaining to the characteristics and the factors, or parameters, affecting performance were abstracted from those reports. These abstracted data were related to the categories of equipment components. A general correction factor of .008145 was computed and applied multiplicatively to all data to compensate for the laboratory conditions under which they were generated. The results were integrated and organized into a data store. Table 1 presents an excerpt from the AIR Data Store. If a display designer wanted to evaluate the human performance impact (time and reliability, in this case) of a 2.00" diameter scale display with a moving pointer requiring quantitative reading, with a conventional horizontal bar with 0 at the base requiring no parallax reading, the calculation would be:

Time = .50 + 1.50 + 0 = 2.00 seconds for reading

Reliability = .9996 x .9996 x .9990 = .9952

The application of the AIR Data Store requires the completion of six major steps:

1. Organize Equipment and Operating Information.

Data obtained from task analysis and other sources must be analyzed into behavioral steps and sequenced by mission phases of operation.

2. Collect Evaluation Data. This step includes identification of relevant components, parameters, and dimensions for each step, matching these values with the data in the AIR Data Store, and entering the appropriate values on an evaluation sheet.

3. Score Evaluation Sheet. Step scores are computed for each aspect of behavior and across aspects for total step scores by adding the relevant time entries and multiplying the reliability estimates. These totals are entered on the evaluation sheets.

4. Summarize Results by Mission and Phase. Total values for each phase of a mission and for the total mission are computed from the data on the evaluation sheet, similar to the method for obtaining step totals. The results of this summary are entered on the mission and phase summary sheet.

5. Summarize Results by Component. Total values for each component of the input, mediating process, and output aspects of behavior are computed across the steps of each phase of the mission. The values are entered on a component summary form.

Table 1. Air Data Store Example  
(Source: Topmiller, et.al., 1982)

CIRCULAR SCALES		
<u>BASE TIME = .50</u>		
Time added	Reliability	
.103	.9996	1. Scale diameter a. 1" b. 1.6-1.75" c. 2.75"
0	.9997	
.03	.9993	
1.50	.9966	2. Scale style a. Quantitative reading (Determine a specific value.) (1) Moving pointer (2) Moving scale
1.50	.9967	b. Qualitative reading and checking (Determine whether indication is within a certain range.) (1) Moving scale (2) Moving pointer (3) Either moving pointer or moving scale, if color coded.
.25	.9965	
.25	.9975	
0	.9999	3. Pointer style a. Conventional, horizontal bar, 0 at base b. Triangle or vertical bar at base (Pointer base = short end of pointer.)
0	.9990	
1.40	.9987	4. Parallax (Distance the pointer is from the scale face, resulting in misreading when viewed from an angle.) If parallax is sufficient to result in an error of one graduation mark (for quantitative read), these data apply.
3.50	.9900	
2.70	.9975	5. Interval spacing (Physical distance between marks) a. Less than 1/20 inch b. More than 1/20-1/4 inch c. More than 1/4-2 inch
1.10	.9986	
0	.9996	6. Number of graduation marks per unit of required resolution. (The assessment of this parameter involves two simple steps: 1. Define required resolution, e.g., must read to 5°. 2. Determine number of graduation marks used for each five degrees represented on the scale.
		A graduation mark for each degree (5:1) would be inappropriate, since the unit of required resolution is five degrees. On the other hand, the presence of one graduation mark for every 20° (1:4) also would be inappropriate, since a high degree of interpolation would be necessary in order to read to the required resolution.
		It should be noted that the determination of the units of required reading resolution, while absolutely necessary for assessment of the parameter discussed here, is not, in itself, a parameter requiring evaluation.) a. Every one or two units (include staircase) b. Every 5th unit c. Every 10th unit or log scales
0	.9996	
2.56	.9985	
2.78	.9975	

6. Derive Recommendations. Based on the summarized results of the evaluation listed above, recommendations may be developed in the following three areas:
  - a. Redesign. Redesign recommendations are based on consideration of total component scores and selection of alternate dimensions from the information contained in the data store to improve potential operator performance.
  - b. Training. Training recommendations are based on analysis of the component summary form and will identify aspects of performances that should be given special attention in the training of operators.
  - c. Selection. Selection recommendations are based on identification of aspects of behavior that contribute significantly to total mission scores. These aspects may then be related to general selection requirements for operators.

The AIR Data Store represents the most complete human error data bank for use during the design process because it contains data relating human error probabilities to design features. The AIR Data Store was experimentally validated in 1973 under reasonably controlled conditions. The findings indicated a low but positive correlation between Data Store predictions and empirical performance reliabilities.

The AIR Data Store is intended for use during the design process for purposes of estimating human error probabilities. It is not intended, nor should it be used, for estimating human reliability in existing systems. It does not account for performance shaping factors (PSFs) such as time constraints, poor working conditions, fatigue, fear, etc.

### Bunker-Ramo Tables.

Developed by D. Meister, this data bank was constructed from 37 experimental studies plus subjective estimates of the percentage contribution various parameters contributed to the error that would arise in the situations described in the data base. The Bunker-Ramo Tables are divided into four parts: 1) the function to be performed, 2) the parameters considered in deriving the probability estimates, 3) the probability estimates themselves, and 4) notes which describe the rationale behind the probability estimates, parameters not included in these estimates, and various other caveats. An example of a Bunker-Ramo Table is given in Table 2.

### Aerojet General Method.

The Aerojet General Human Reliability in the Performance of Maintenance method was developed specifically to predict personnel effectiveness during scheduled check-out and maintenance activities performed on the Titan II propulsion system. The technique combined task analysis, expert judgment, and the AIR Data Store to estimate human reliability in selected maintenance functions. Since it accesses the AIR Data Store and other data sources, it cannot properly be called an actual data base itself but rather is a method for human-reliability data estimation. However, data tables specific to the Titan II maintenance tasks were prepared and reported.

The Aerojet General data tables give the task descriptor for the Titan II maintenance action, whether one (individual) or two (redundant) mechanics performed the task, their ultimate human reliability, and whether it was a critical task that led to system degradation or to complete system failure. The Aerojet General Method consists of the following steps:

1. Specify the maintenance tasks to be performed,  
e.g., service oil pump of turbopump, perform  
function check of thrust-chamber valves, or  
perform leak check of fuel system.
2. Identify the task elements that must be performed  
to accomplish the total task, e.g., verify switch

position, connect flexible hose, read time (brush recorder), or install lockwire.

3. From judges familiar with maintenance tasks and typical Air Force mechanics, obtain rating for likelihood of error in performing the task elements.
4. Obtain empirically based reliability estimates for at least some of the task elements. The AIR Data Store figures are extrapolations to field conditions based on the results of laboratory studies available in the experimental literature.
5. Prepare a scatter diagram for the task elements for which both ratings and empirically based reliability estimates are available. Fit a regression equation to the data and derive reliability estimates for the task elements for which only ratings are available.
6. If a second mechanic will be available to assist the first one in the performance of the task, adjust the task element reliability to take this redundancy into account.
7. Working from a detailed set of procedural instructions, determine the task elements involved in performing each maintenance task. Record the appropriate reliability estimate for each task element.
8. Determine the task performance reliability by computing the product of the separate task-element reliabilities.

Table 2. Bunker-Ramo Example  
 (Source: Topmiller et.al., 1982)

FUNCTION

Observe meter(s) to determine value displayed.

PARAMETERS

Number of meters: one; several (approximately 4);

Type of dial reading: qualitative; quantitative;

Data recording; required; not required;

Visibility/viewing time: adequate; restricted

No. of meters:	One	Several	Qualitative Reading	Quantitative Reading	Visibility Viewing Time: Adequate	Visibility Viewing Time: Restricted	Date Recording Not Required	Date Recording Required	Probability Estimate
(1)	x		x	x	x				.9994
(2)	x		x	x		x			.9990
(3)	x	x			x x				.9965
(4)	x	x		x		x			.9973
(5)	x	x	x			x			.9952
(6)	x	x			x x				.9873
(7)	x		x x		x				.9977
(8)	x		x x			x			.9955
(9)	x		x x		x				.9865
(10)	x		x x			x			.9825
(11)	x		x		x x				.9685

An example of the Aerojet General data base developed for the Titan II propulsion system maintenance and check-out activities is given in Table 3.

The Aerojet General method for estimating human reliability depends largely on the use of the AIR Data Store in conjunction with a task analysis and expert judgment for application to specific maintenance functions. The actual tabled values are unique and specific to the Titan II propulsion-system maintenance.

The quantitative human reliability information should aid decision making in each of the following areas:

- Designing the propulsion system and supporting equipment for both operations and maintenance.
- Providing clear and effective checklists and technical orders.
- Providing effective inputs to the training of Titan II missile engine mechanics.

Reliability is clearly a function of additional factors, including attitudes, feelings and motivations of Air Force mechanics.

Applicability to DECAID is dependent upon the degree of overlap between the Titan II propulsion system maintenance tasks and those shipboard tasks with which the DCA would be concerned.

TEPPS.

The Technique for Establishing Personnel Performance Standards (TEPPS) was reported by Blanchard, Mitchell, and Smith (reproduced in Topmiller, et al., 1982). The system to be evaluated is described by a Graphic State Sequence Model (GSSM) which identifies, on the basis of a functional flow diagram, the various ways in which system requirements can be accomplished. The basic behavioral unit of the GSSM is the personnel-equipment functional (PEF) unit analogous to the task. The GSSM is transformed into a Mathematical State Sequence Model (MSSM) which uses probability equations to describe the mathematical relationships among the GSSM units.

Table 3. Aerojet Example  
(Source: Topmiller et. al., 1982)

		<u>Human Reliability</u>		
	<u>Stage</u>	<u>Indi- vidual</u>	<u>Redun- dant</u>	<u>Criti- cality</u>
Prepare for Pressure-Decay Check of Turbopump Gearbox	I	.9327	.9535	2
Prepare for Electrical Check	II	.9337	.9523	3
Perform Pressure-Decay Check of Turbopump Gearbox	II	.9350	.9553	3
Perform Visual Inspection of Areas Worked on in Test Above, to Ensure Hardware Integrity and That all Tools Have Been Removed from Area	I	.9478	.9603	3
Service Oil Sump of Turbopump Gearbox	II	.9544	.9686	3
Prepare for Turbopump Torque Check	II	.9575	.9727	3
Prepare for Installation of Gearbox Pressurization Kit	I	.9583	.9728	3
Perform Visual Inspection of Areas Worked on in Test Above, to Ensure Hardware Integrity and That all Tools Have Been Removed from Area	II	.9590	.9794	3
Perform Turbopump Torque Check of Subassembly	I	.9601	.9751	3
Prepare for Installation of Gearbox Pressurization Kit	II	.9609	.9747	3
Prepare for Subassembly Turbopump Torque Check	I	.9634	.9917	2

TEPPS employs two general measures: probability of task accomplishment and performance completion time. It rejects data from experimental literature since the authors thought that usable data from such sources is comparatively rare. The TEPPS data bank was developed using a complex paired-comparison technique derived from "expert" estimates of performance and time. The data were developed by providing expert judges with individual PEF task descriptions and asking them to pairwise compare each description against all others to determine which has the highest probability of accomplishment.

The data resulting from the paired-comparison technique formed a interval scale with values varying from around 3.0 to 0.0. These scale values were transformed into a more conventional probability scale, ranging from .90 to .9999, and were termed Indices of Task Accomplishments (IOTAs). The resultant probabilities could be used as estimators of the probability of accuracy with which tasks could be performed.

The model was developed to allocate pre-existing personnel performance standards among the personnel and tasks involved in the system. TEPPS does not include any performance shaping factors such as those used by THERP. Moreover, it does not deal with molecular equipment characteristics such as those in the AIR Data Store. The model is supposed to yield a measure of system effectiveness which is essentially the same as that produced by THERP.

An example of the data included in the TEPPS data base is presented in Table 4.

#### OPREDS.

The Operational Recording and Data Systems (OPREDS) was the first attempt to measure, record, and store operational human-performance data. The technique was applied by the Navy Electronics Laboratory in San Diego, California, in the late 1960's and early 1970's for the collection of human-performance data at sea utilizing the Navy Tactical Data System (NTDS).

The Navy Electronics Laboratory installed the OPREDS equipment in the NTDS system of several ships performing tactical command/control functions by tapping terminals in the system's central pulse amplifier which sample all

**Table 4. TEPPS Example  
(Source: Topmiller et. al., 1982)**

ITEM	Stimulus Activity	# of ranks	Scale Value (100)	IOTA	Scale Value (80)	IOTA
91	1. Observe CRT continuously and note and record malfunction (Monitor CRT, detect and record malfunction when it occurs)	2.6	0.0000	.9000	0.0000	.9000
12	2. Knowing all relevant symptoms, read schematic diagram and determine defective circuit card (Schematic diagram = circuit diagram)	2.8	0.0202	.9032	0.0225	.9031
76	3. Knowing all relevant symptoms, read data flow diagram and determine defective circuit card (Block or logic flow diagram showing information flow)	9.5	0.1775	.9245	0.1562	.9197
100	4. Find unlabeled test point of interest by referring to schematic diagram	4.6	0.4595	.9517	0.4993	.9504
63	5. Knowing all relevant symptoms, follow <u>procedural instructions</u> and determine defective circuit card (Written or verbal step-by-step procedures)	4.7	0.5788	.9601	0.6259	.9584
38	6. Compare size and type of radar target with known standard (The activity is performed correctly when the comparison judgement identifies the target correctly)	9.0	0.5790	.9601	0.6062	.9573

NTDS console operator actions (switch activation, button manipulations, etc.). Recently, the OPREDS data have become capable of being processed and integrated with an Automated Task Inventory developed under contract to the Naval Ocean Systems Center (NOSC).

The OPREDS outputs are in the form of 30-bit parallel words which are converted to serial bit streams and recorded on magnetic tape. The tape can then be played back at the laboratory for intensive analysis. The tapes are processed for input to an IBM 360/65. On the tape are words generated by keyed-in actions. These words identify the particular function code, the originating console, and its mode of operation. Clock impulses are also recorded on the tape to supply chronological benchmarks. Under a recent contractual effort by System Exploration Incorporated (SEI) for NOSC, a behaviorally based taxonomy was developed which includes the following categories: monitoring, procedural, anticipation/planning, communication, and continuous activities. These tasks are classified in their associated button actions and will serve as a library to enable computer software to determine which tasks an operator performed or was attempting to perform when the OPREDS/raw data tapes are reviewed.

NTDS data were collected at sea during varying periods over 5-10 years. Unfortunately, to our knowledge no reports were ever issued by OPREDS developers to describe the data they had gathered and the analyses they had performed. Because the technique involves automatically recording data directly from operational performance, its content validity can be assumed; however, it is not clear how comprehensive the OPREDS data are, because there is no provision for recording anything other than switch turning and button pushing. Conceivably, the recent SEI effort might assess the comprehensiveness of the OPREDS data once the actual data are used in the Automated Task Inventory technique, but the lack of estimates for diagnosis or decision-making is a serious limitation. Meister (1984) also reports OPREDS never led to publishable data because inadequacies in its instrumentation made it too slow for the actions it was supposed to record. Perhaps innovations in computer technology will eliminate inadequacies eventually.

### **General Physics Data Bank.**

The General Physics Data Bank (see Bell, Nicolosi, Treater, Rose and James, 1988; Comer, Kozinnsky, Echel & Miller, 1983) was started by compiling data from other, older data banks. Usable data from the Aerojet General methods, the AIR Data Store, and Bunker-Ramo tables, and THERP were processed for inclusion. Data are also included from other sources such as experimental studies. Candidate data are reviewed by data-bank experts who first convert any useful information to human-error probabilities (error-relative frequencies).

The data are organized and classified for each of access based on a taxonomy of error similar to a Berliner human-error classification (See Figure 1). It resembles a three-tier matrix of equipment characteristics by human actions. Within any level of the matrix, the intersection of an equipment characteristic with a human action is called a cell. Cells contain human reliability data appropriate to their matrix level (See Figure 2).

Many of the cells in the data bank are empty since there has been no systematic, across-the-board collection of human-reliability data. On the other hand, some cells contain data from more than one source. If two or more sources exist, the data bank experts could combine the data using the data combination scheme. The matrix displays all the information obtained, allowing the user to select the entry most representative of the types being evaluated. The data are presently being accessed by hand although there are plans to allow computer-accessing. The user completes a series of queries about the nature of the action being evaluated and is led through the hierarchy to the appropriate matrix and data cell.

The General Physics Data Bank was designed specifically to support human reliability analysis (HRA) in the context of probabilistic risk assessment (PRA) and constitutes the most complete human-reliability data for PRA. It is, however, oriented toward nuclear power plant (NPP) operations; thus it is unclear how directly applicable this datta bank will be to DECAID applications.

### **THERP.**

The Technique for Human Error Rate Prediction (Swain and Guttmann, 1983) is a method for modeling human reliability using data from a human

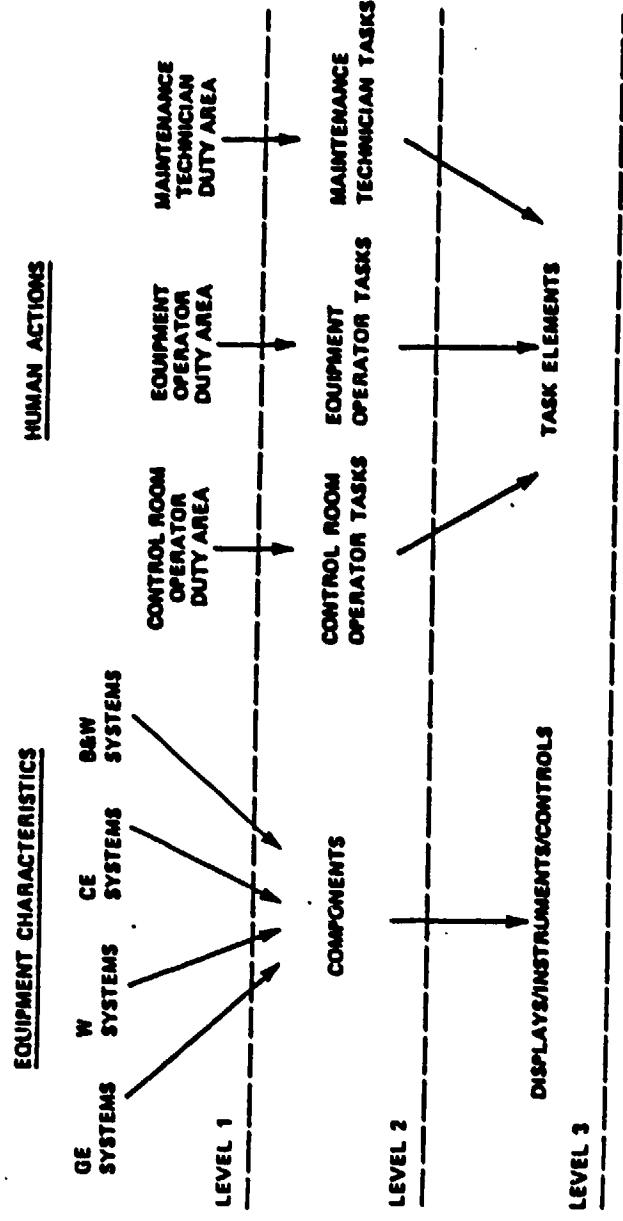


Figure 1. Hierarchical Structure of the General Physics Taxonomy

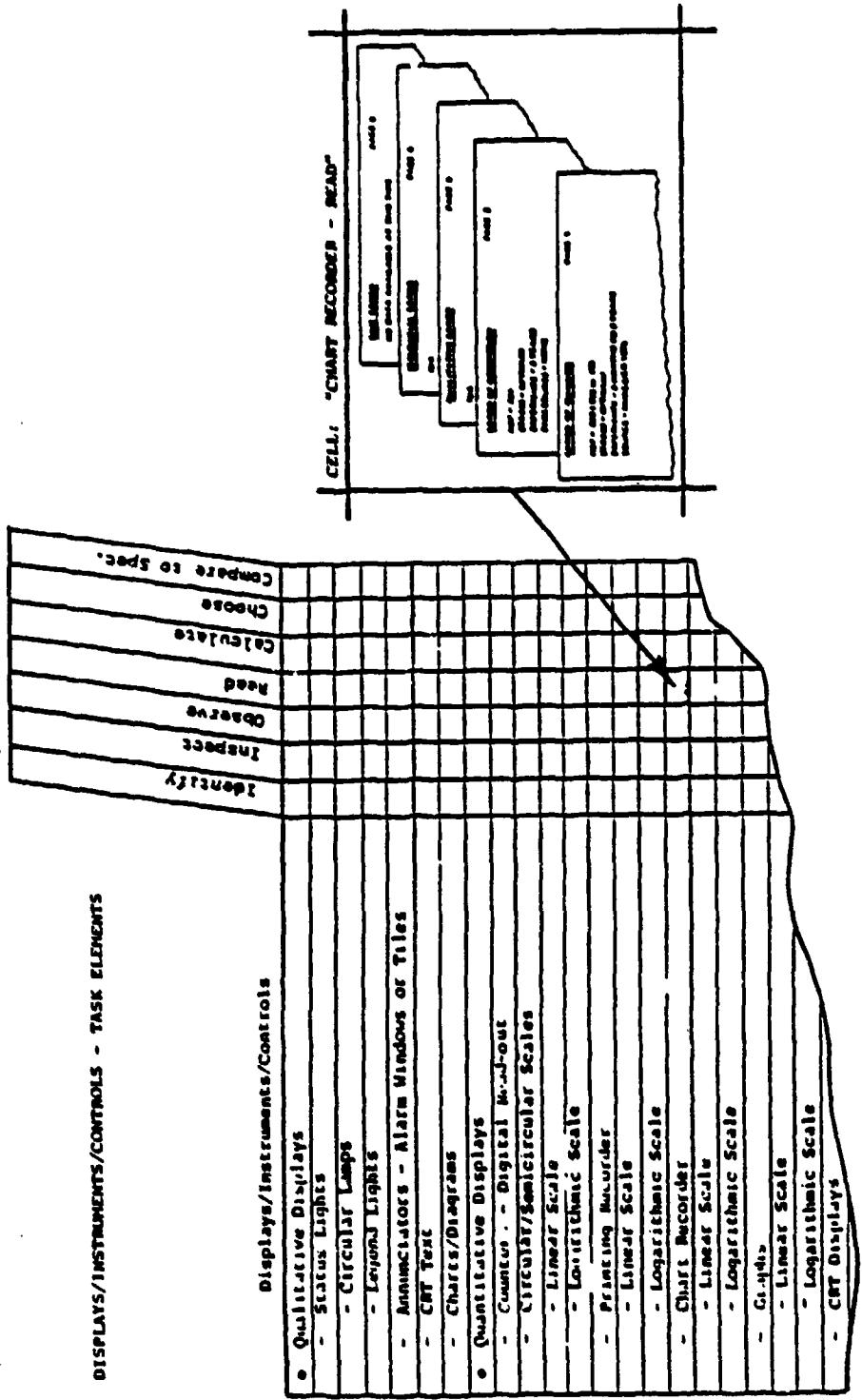


Figure 2. Error Types in a Typical Cell

reliability data base or, more often, from expert subjective estimates. An event tree is used to represent an operation's task sequence. At each node of this tree the task is either done correctly or incorrectly and so these two events' probabilities must always sum to 1.0 at each node. A decision must be made about whether all tasks in the tree must be done correctly (termed a "series" system) or whether success on any task leads to success on the operation (termed a "parallel" system). These concepts are represented in Figure 3. Human Error Probability (HEP) multipliers for the performance shaping factor (PSF) of psychological stress provided in Swain and Guttmann (1982) are reproduced in Table 5.

#### Inputs:

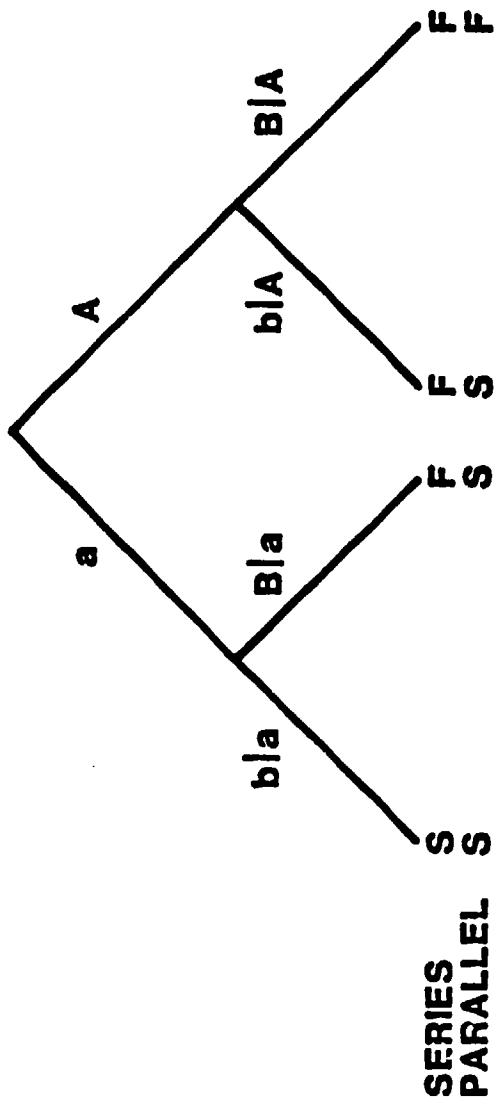
In general the inputs to a human reliability data base are a detailed task description of the operation. Depending on the data base to be used, the task description must be either very fined-grained (cf. AIR Data Store), or more task-oriented (cf. Swain and Guttmann, 1983). The AIR Data Store, for instance, is indexed by display factors, type of information displayed, and task parameters (e.g., time stress, parallax, etc.). By contrast, Swain and Guttmann's (1983) Human Error Probabilities (HEPS) are referenced with respect to fairly global tasks (e.g., "error probabilities that a checker will fail to detect errors made by others"). THERP, of course, requires all conditional and initial (unconditional) probabilities for the model as its inputs.

#### Outputs:

The outputs from these data bases and models are probability of error (or success) and possibly the time associated with completing each of a set of subtasks.

#### Validation:

The AIR Data Store has received some empirical validation (see Topmiller, et al., 1983). The Bunker-Ramo Tables are reported not to have been validated (Topmiller, et al., 1982). The authors are not aware of any validation done on the Aerojet data specific to the Titan II propulsion system. The authors are also not aware of any validation which has been done on the TEPPS data. THERP has been used and studied extensively in nuclear power and



TASK 'A' = THE FIRST TASK

TASK 'B' = THE SECOND TASK

$a$  = PROBABILITY OF SUCCESSFUL PERFORMANCE OF TASK 'A'

$A$  = PROBABILITY OF UNSUCCESSFUL PERFORMANCE OF TASK 'A'

$b|a$  = PROBABILITY OF SUCCESSFUL PERFORMANCE OF TASK 'B' GIVEN  $a$

$b|a$  = PROBABILITY OF UNSUCCESSFUL PERFORMANCE OF TASK 'B' GIVEN  $a$

$b|B/a$  = PROBABILITY OF SUCCESSFUL PERFORMANCE OF TASK 'B' GIVEN  $A$

$b|B/a$  = PROBABILITY OF UNSUCCESSFUL PERFORMANCE OF TASK 'B' GIVEN  $A$

FOR THE SERIES SYSTEM:

$$Pr[S] = a(b|a)$$

$$Pr[F] = 1 - a(b|a) = a(B|a) + A(b|A) + A(B|A)$$

FOR THE PARALLEL SYSTEM:

$$Pr[S] = 1 - A(B|A) = a(b|a) + a(B|a) + A(b|A)$$

$$Pr[F] = A(B|A)$$

Figure 3. HRA Event Tree  
 (Source: Swain & Guttman, 1983)

Table 5. Modification of Estimated HEPs for  
Effects of Stress and Experience Levels  
(Source: Swain & Guttman, 1982)

Stress Level	<u>Modifiers for Nominal HEPs*</u>	
	Skilled**	Novice**
<u>Item</u>	<u>(a)</u>	<u>(b)</u>
(1) Very low (Very low task load)	x2	x2
Optimum (Optimum task load):		
(2). Step-by-step <sup>†</sup>	x1	x1
(3) Dynamic <sup>†</sup>	x1	x2
Moderately high (Heavy task load):		
(4) Step-by-step <sup>†</sup>	x2	x4
(5) Dynamic <sup>†</sup>	x5	x10
Extremely High (Threat stress)		
(6) Step-by-step <sup>†</sup>	x5	x10
(7) Dynamic <sup>†</sup> Diagnosis <sup>††</sup>	.25 (EF = 5) These are the actual HEPs to use with dynamic tasks or diagnosis-- they are <u>NOT</u> modifiers.	.50 (EF = 5)

\* The nominal HEPs are those in the data tables in Part III and in Chapter 20. Error factors (EFs) are listed in Table 20-20.

\*\* A skilled person is one with 6 months or more experience in the tasks being assessed. A novice is one with less than 6 months or more experience. Both levels have the required licensing or certificates.

† Step-by-step tasks are routine, procedurally guided tasks, such as carrying out written calibration procedures. Dynamic tasks require a higher degree of man-machine interaction, such as decision-making, keeping track of several functions, controlling several functions, or any combination of these. These requirements are the basis of the distinction between step-by-step tasks and dynamic tasks, which are often involved in responding to an abnormal event.

†† Diagnosis may be carried out under varying degrees of stress, ranging from optimum to extremely high (threat stress). For threat stress, the HEP of .25 is used to estimate performance of an individual. Ordinarily, more than one person will be involved. Tables 20-1 and 20-3 list joint HEPs based on the number of control room personnel presumed to be involved in the diagnosis of an abnormal event for various times after annunciation of the event, and their presumed dependence levels, as presented in the staffing model in Table 20-4.

military applications; however, no real validation of THERP predictions has been conducted (see Swain and Guttman, 1983, p. 5-22; Miller and Swain, 1987).

**Comments:**

Accuracy is a critical measure of human performance and this makes HRA an important endeavor. In DECAID applications, performance accuracy on shipboard tasks may be used to model crew performance to support decisions on manning (for redundancy, cross-checking, etc.), time management (e.g., to accommodate error recovery), and safety management. Therefore, the relevance of human reliability data bases and models, in principle, cannot be denied. The difficulty arises in gathering such data, in indexing it in a data base, and in developing models which concatenate the HEPs into an overall task assessment.

Pew, Baron, Feehrer, and Miller (1977) have pointed out two general approaches to taxonomic classification and data base indexing. The molecular approach, exemplified in the AIR Data Store, describes hardware items in terms of component attributes. To use this, the crew-system interaction to be evaluated must be described in equally molecular terms and the resulting reliability estimates must then be aggregated according to some rule, often of uncertain form.

Alternatively, one can use the task or operation as the basic unit of analysis, such as in Swain and Guttman (1983). This approach uses global units of description for indexing and eliminates the need to aggregate molecular aspects. It appears that a more global approach would be easier to work with in the context of DECAID. For example, perhaps human reliability assessments could be usefully indexed with respect to critical shipboard operations (e.g., CIWS weapon loading, linehandling, manning the P-250 pump, signal bridge operations, etc.). No such taxonomic classification and associated data base currently exist to our knowledge.

Miller and Swain (1987) point out that there are basically four sources of human reliability data: the field, simulator activities, laboratory experiments, and expert judgement. Field data, while most difficult to collect, would probably be of highest validity. The Operational Recording and Data System (OPREDS) was an attempt to collect operational performance data through the Naval Tactical Data System (NTDS). However, as

Topmiller, et al. (1982) report, no reports were issued by OPREDS developers on the nature of the data they collected at sea. Perhaps the OPREDS project will provide useful human reliability data on shipboard operations in the future. Alternatively, Fleet Training Group staff could possibly gather human error data during refresher training exercises. Meister (1984) warns, however, that manual collection may err because the observer may fail to recognize an error, or may altogether miss rapid or covert errors. In addition, as new automated data processing systems are fielded, there may be an opportunity to collect online records of errors made. Finally, self reporting schemes might be useful. Again, Meister warns that people may be reluctant to confess making an error, may forget to report or may provide inadequate detail. He sights gross inaccuracies in the Navy's 3M system as an example of these problems.

In practice, there are several impediments to constructing human reliability data bases through simulator activities and laboratory experiments. Human error is usually infrequent and this makes it difficult to conduct experiments or simulations to gather actuarial data. Unless one can gather large volumes of data, it is unclear whether or not

1. the errors observed constitute an exhaustive catalogue of errors which can be made,
2. the relative frequencies of occurrence are good estimates of error probabilities, and
3. erroneous performance in the study resembles erroneous performance in the operational environment (i.e., due to the similarity in performance shaping factors such as subjects, psychological analysis, environment, etc.).

If simulator data were collected in large volumes or a period of time, e.g., from many different organizations, it is possible that useful data for human reliability analysis could be garnered.

Whether data are gathered in the field or through simulation or experimentation, yet another difficulty with the nature of the data is that of

constancy. Error likelihoods might be expected to change with increased practice/experience, with changes in equipment, procedures, or manning, with the complication of various performance shaping factors such as stress, ship motion, MOPP gear, with speed-accuracy trade-off and so forth. Therefore, the error probability estimates one collects for one set of conditions may not be fully applicable for another set of conditions or crew members. Alternatively, modeling the impact of PSFs is difficult at best.

Because of the difficulty associated with collecting objective error data, it is likely that subjective estimates of error and completion time will be a part of any human reliability analysis for some time to come. In order that subjective estimates be used thoughtfully, it is desirable to know the extent to which people can predict/estimate highly unlikely events.

Stillwell, Seaver, and Schwartz (1982) and Seaver and Stillwell (1983) have reviewed the issues and methods related to subjective human reliability estimates. They conclude that from a practical standpoint, psychological scaling procedures can be used to elicit subjective human reliability estimates from experts. However, they also point out a particularly weak link in this methodology is the transformation of the subjective scale values into probabilities. Since the validation of such estimates relies upon actuarial data (the complexities of which have been noted earlier), it is not clear that such validation will be forthcoming any time soon.

Our conclusion is that existing human reliability data bases cannot be implemented for DECAID use outright. Some data may be of value but determination of this will require a careful match between appropriate descriptions of shipboard critical tasks and existing HRA data for comparable tasks described (or redescribed) in a similar vocabulary. We anticipate a need to construct shipboard specific data using a mix of the methods discussed above.

### 3.7 TIME AND MOTION DATA BASES AND MODELS

**Titles:** Various. See Description below.

**References:**

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Smith, G.L. Work measurement: A systems approach. Columbus, OH: Grid Publishing.

**Description:**

Perhaps the most fundamental measure of human performance is time to perform a task. DECAID's human performance prediction system (HPPS), then, would presumably be incomplete without some prediction of the time needed to perform various shipboard operations. One means of arriving at such predictions is to use data from a database of completion times for various tasks. Time and motion data bases are potentially applicable for this purpose. Officers aboard ship (e.g., COs, DCAs) could use such completion time predictions to manage watch length, estimate maximum number of evolutions possible per unit time, assess the impact of MOPP gear, manning changes, workarounds, etc. on time to complete a shipboard operation, and so forth.

A variety of time and motion data bases are currently available from which to synthesize completion times. Table 6 provides a quick review of some traditional time and motion data systems. As a specific example, consider the Methods Time Measurement (MTM) system (Chaffin and Andersson, 1984). This system uses a carefully defined vocabulary of elementary motions (e.g., move, reach, position, release, grasp, etc.) to index their data. Table 7 provides an example of the time required to move various objects about in a workplace. The times in this table (given in .00001 hr units called time measurement units or TMUs) are a function of the distance moved, the weight of the object moved, and the nature of the move itself. Thus, if one moves a load of 4-kg with one hand a distance of 10 cm to an indefinite location, the move time is a linear function:

$$6.8(1.07) + 2.8 = 10.1 \text{ TMU or } .36 \text{ seconds.}$$

**Inputs:**

The inputs to a time and motion data base are a detailed task analysis of the operation which is to be modeled. The level of description varies with different data bases and with different versions of the same time and motion system.

**Table 6. Traditional Motion-Time Data Systems**  
 (Source: Barnes, 1968)

Name of System	Date First Applied	First Publication Describing System	Publication Containing Information about System	How Data Were Originally Obtained	System Developed by
Motion-time analysis (MTA)	1924	Data not published, but information concerning MTA published in <i>Motion-Time Analysis Bulletin</i> , a publication of A. B. Segur & Co.	"Motion-Time-Analysis" by A. B. Segur, in <i>Industrial Engineering Handbook</i> , H. B. Maynard, editor, McGraw-Hill Book Co., New York, pp. 4-101 to 4-118, 1956.	Motion pictures micromotion analysis, kymograph	A. B. Segur
Body member movements	1938	<i>Applied Time and Motion Study</i> by W. G. Holmes, Ronald Press Co., New York, 1938	<i>Applied Time and Motion Study</i> by W. G. Holmes, Ronald Press Co., New York, 1938	Not known	W. G. Holmes
Motion-time data for assembly work (get and place)	1938	<i>Motion and Time Study</i> , 2nd ed., by Ralph M. Barnes, John Wiley & Sons, New York, 1940, Chapters 22 and 23	<i>Motion and Time Study: Design and Measurement of Work</i> , 6th ed., by Ralph M. Barnes, John Wiley & Sons, New York, 1968, Chapter 30	Time study, motion pictures of factory operations, laboratory studies	Harold Engstrom and H. C. Geppinger, Bridgeport Plant of General Electric Co.
The work-factor system	1938	"Motion-Time Standards" by J. H. Quick, W. J. Shea, and R. E. Koehler, <i>Factory Management and Maintenance</i> , 103(5), 97-108 (May 1945)	<i>Work-Factor Time Standards</i> , by Joseph H. Quick, James H. Duncan, and James A. Malcolm, Jr., McGraw-Hill Book Co., New York, 1962 <i>Ready Work-Factor Time Standards</i> , by J. A. Malcolm, Jr. et al., Haddonfield, N. J., 1966	Time study, motion pictures of factory operations, study of motions with stroboscopic light unit	J. H. Quick W. J. Shea R. E. Koehler
Elemental time standard for basic manual work	1942	"Establishing Time Values by Elementary Motion Analysis," by M. G. Schaefer, <i>Proceedings Tenth Time and Motion Study Clinic</i> , IMS, Chicago, November, 1946. Also "Development and Use of Time Values for Elemental Motions" by M. G. Schaefer, <i>Proceedings Second Time Study and Methods Conference</i> , SAM-ASME, New York, April, 1947	"Establishing Time Values by Elementary Motions" by M. G. Schaefer, <i>Proceedings Tenth Time and Motion Study Clinic</i> , IMS, Chicago, November, 1946. Also "Development and Use of Time Values for Elemental Motions" by M. G. Schaefer, <i>Proceedings Second Time Study and Methods Conference</i> , SAM-ASME, New York, April, 1947	Kymograph studies, motion pictures of industrial operations, electric timer-recorder studies (time measured to 0.0001 min)	Western Electric Co.
Methods-time measurement (MTM)	1948	<i>Methods-Time Measurement</i> by H. B. Maynard, G. J. Stegemerten, and J. L. Schwab, McGraw-Hill Book Co., New York, 1948	<i>Methods-Time Measurement</i> by H. B. Maynard, G. J. Stegemerten, and J. L. Schwab, McGraw-Hill Book Co., New York, 1948	Time study, motion pictures of factory operations	H. B. Maynard G. J. Stegemerten J. L. Schwab
Basic motion time study (BMT)	1950	Manuals by J. D. Woods & Gorton, Ltd., Toronto, Canada, 1950	<i>Basic Motion Timestudy</i> by G. B. Bailey and Ralph Presgrave, McGraw-Hill Book Co., New York, 1958	Laboratory studies	Ralph Presgrave G. B. Bailey J. A. Lowden
Dimensional motion times (DMT)	1952	"New Motion Time Method Defined" by H. C. Geppinger, <i>Iron Age</i> , 171(2), 106-108 (January 8, 1953)	<i>Dimensional Motion Times</i> by H. C. Geppinger, John Wiley & Sons, New York, 1955	Time study, motion pictures, laboratory studies	H. C. Geppinger
Predetermined human work times	1952	"A System of Predetermined Human Work Times" by Irwin P. Lazarus, Ph.D. thesis, Purdue University, 1952	"Synthesized Standards from Basic Motion Times," <i>Handbook of Industrial Engineering and Management</i> , W. G. Ireson and E. L. Grant, editors, Prentice-Hall, Englewood Cliffs, N.J., pp. 373-378, 1955	Motion pictures of factory operations	Irwin P. Lazarus

Table 7. Predicted Hand Transport Move-Time Data  
 (Source: MTM Association for Standards and Research)

Distance Moved (cm)	Time TMU				Allowance				Case and Description
	A	B	C	Hand in Motion B	Weight (kg.) up to	Constant (TMU)	Factor		
0 to 2	2.0	2.0	2.0	1.7	1	0	1.00		A Move object to other hand or against stop
4	3.1	4.0	4.5	2.8	2	1.6	1.04		
6	4.1	5.0	5.8	3.1					
8	5.1	5.9	6.9	3.7					
10	6.0	6.8	7.9	4.3	4	2.8	1.07		
12	6.9	7.7	8.8	4.9					B Move object to approximate or indefinite location
14	7.7	8.5	9.8	5.4					
16	8.3	9.2	10.5	6.0					
18	9.0	9.8	11.1	6.5					
20	9.6	10.5	11.7	7.1	8	5.8	1.17		
22	10.2	11.2	12.4	7.6	10	7.3	1.22		C Move object to exact location
24	10.8	11.8	13.0	8.2					
26	11.5	12.3	13.7	8.7					
28	12.1	12.8	14.4	9.3	12	8.8	1.27		
30	12.7	13.3	15.1	9.8	14	10.4	1.32		
35	14.3	14.5	16.8	11.2					C Move object to exact location
40	15.8	15.6	18.5	12.6					
45	17.4	16.8	20.1	14.0	16	11.9	1.36		
50	19.0	18.0	21.8	15.4					
55	20.5	19.2	23.5	16.8	18	13.4	1.41		
60	22.1	20.4	25.2	18.2					C Move object to exact location
65	23.6	21.6	26.9	19.5					
70	25.2	22.8	28.6	20.9					
75	26.7	24.0	30.3	22.3	20	14.9	1.46		
80	28.3	25.2	32.0	23.7					

#### **Outputs:**

The outputs from the time and motion data bases (and their associated methods) is an estimate of the normal time needed to complete the task.

#### **Validation:**

Time and motion data bases and models have been used extensively. The authors are, however, not aware of any specific studies which validated the results of a time and motion data base with actual performance.

#### **Comments:**

The applicability of time and motion data bases in DECAID human performance prediction is constrained by several factors. First, there is not, of our knowledge, a task analytic data base of critical shipboard operations which maps easily into a system such as MTM. Second, the time and motion data base methods do not work well for tasks which have a primarily cognitive component. Third, time and motion data bases express tasks in terms of discrete units; in fact, many tasks are continuous. Fourth, errorless performance is assumed, so time and motion data bases do not capture variations in method and mistakes made. Fifth, many performance shaping factors which can affect completion time (e.g., ship motion, MOPP gear) are not represented in such data bases. Sixth, expert judgement is required in order to structure time from time and motion data bases. Seventh, the time and motion data bases imply a specific pace of work (and associated trade-off between speed and accuracy) which may not reflect the pace of shipboard operations. Eighth, the time and motion data bases usually have no variance data included in them, thus making simulation of human performance difficult to execute.

The general methodology of time and motion data bases and models may be of greater relevance to DECAID than any particular data base itself. It seems that preparing such a data base from shipboard operations would be both worthwhile and feasible. However, Meister (1984) has warned that such data collection must be done carefully. He notes that the Navy's 3M system, which require personnel to routinely complete forms describing time to perform a task or to provide information about corrective maintenance, provide data which are known to be grossly incorrect.

## 4.0 CONCLUSIONS/RECOMMENDATIONS

### 4.1 CONCLUSIONS

The purpose of this section is to determine the most appropriate currently existing models and data bases to support the DECAID decision aid/training system. From an extensive review of the literature dealing with Chemical Threat Modeling, Human Performance Modeling, Heat Stress Modeling, War Gaming, Chemical Defense Data Bases and Human Reliability/Time Motion Study it was determined that only a handful of currently existing models and data bases were applicable to and available for the DECAID program.

These models are accessible through the DoD community and except for minor shipping costs are relatively low cost software items. The costs are incurred by the hardware constraints which may be required in order to use the software. Most of the war gaming models require the Personal Computer (PC) to be linked to a DEC VAX system to exercise the complete model (i.e., Nusse II, CWTsar, and NURA). The usefulness to DECAID of these larger, more powerful models is in the information contained in their data bases. These data can be used to develop the required training scenarios for DECAID. Eventually, the following issues will need further definition before an actual DECAID system can be developed. This will allow for the completeness and accuracy to be accomplished.

1. A listing of critical shipboard tasks for which the DCA is responsible.
2. An appropriate level of description for the crew/system interaction.
3. Required vs. actual levels of predictability from the models.
4. Type of output required by the DCA.
5. Further verification/validation of the existing models and data bases.

Each of the models which can support the DECAID system development effort are discussed below using the following format: References, Model Description, Input Parameters, Model Output, Model Validation and Comments.

#### 4.1.1 NURA

##### Reference:

Klopcic, J.T. (1985), Input Manual for the Army Unit Resiliency Analysis (AURA) Methodology, BRL-TR-2670, U.S Army Ballistic Research Lab, Aberdeen Proving Ground, MD.

Kirk, P.R., Boyd, J.D. (1987) Naval Unit Resiliency Analysis User's Guide, Naval Surface Warfare Center, Chemical Systems Branch, Dahlgren, Virginia, 22448-5000.

##### Description:

The program calculates battlefield personnel casualties based on deployment and weapons used by the enemy, and outputs a time versus effectiveness matrix. While executing the program, weak "links" are flagged for later analysis. This allows the user to play various scenarios altering chemical agents, chemical detectors, MOPP levels, deployment and job flow. The user has data available to analyze and determine the effect of each variable on naval combat in a CW environment.

The Naval Unit Resiliency Analysis (NURA) model was selected for use in the capability assessment of Forces Afloat to Chemical and Biological threats project. The Army's Unit Resiliency Analysis (AURA) program and the Navy's NURA are entirely compatible and consistent. Figure 4 provides an overview of the flow through of the AURA or NURA models.

##### Input:

The NURA model requires four types of input data: the functional structure of the ship, deployment data, vulnerability data and threat data. The data must be very complete to accurately describe the conditions so the program can estimate the units resiliency. The data include assets and personnel available, tools to be done in order of priority, the job flow of the

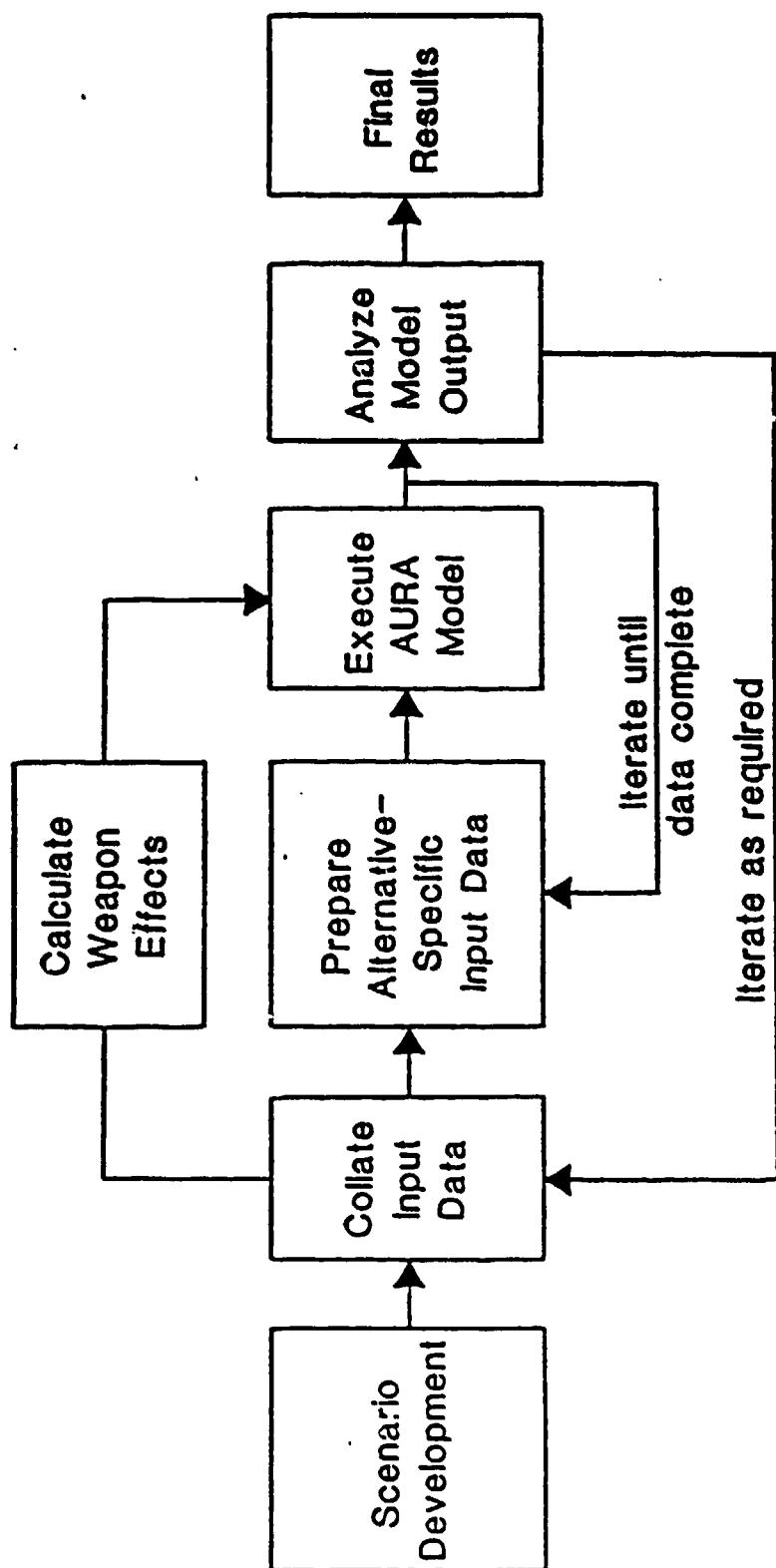


Figure 4. AURA and NURA Flow-Through

tasks, the mission of the ship and each crew station, and the protective posture of personnel initially and throughout the event. NURA methodology looks at each task as if it were an assembly line operation where a crew member does some portion of a task and sends it on to the next crew member. Each crew station would be a separate link and may have redundant or substitute teams that combine to complete the task. When a unique crew member or all crew members at a station become ineffective, the task stops. Straight lines may be modeled with either subchains or chains.

The following parameters can be controlled by the user:

**NAMES:** The names section includes all the items and people available during combat.

**AGENT:** The specific agent threat is spelled out in the agent section.

**DEPLOYMENT:** This section gives detailed information on the location vulnerability and posture of each person.

**LINKS:** This section describes the basic building unit of the model. Each link corresponds to a single task which is then combined to make a chain or mission for the entire unit. Each task has a minimum and maximum number of personnel that may be assigned to it for 100% efficiency.

#### **Output:**

The primary output is an effectiveness versus time matrix for each link, each segment, and the entire unit. If the unit's effectiveness is one (1.00) throughout the encounter, the unit completed one hundred percent of its mission. A study of the effectiveness tables should reveal "weak links and their impact on the unit. After the time versus effectiveness matrices there is a listing of survivors including contaminated personnel.

#### **Validation:**

No data available for NURA. AURA is accepted as a verified model.

#### **Comments:**

NURA provides the capability to evaluate unit effectiveness without the need of custom programing. Experienced military operations analysts can develop new scenarios with minimal effort, so that analyses are of low cost.

NURA is a very good tool for analysis of small unit operations. However, as of January 1988, the NSWC (Dahlgren) version of NURA had some limitations. For example, shipboard activities are divided by department (e.g., Engineering, Damage Control). Thermal stress probabilities are then applied to an entire department even though a specific crew member may actually not be in a similar environment. Thus, a chief engineer in DC Central is treated the same as crew members in the engineering spaces. Furthermore, this version of NURA could , at the time, handle just an agent of just heat stress, but not both. When such limitations are exceeded, it is expected that NURA's usefulness will increase. Specific use for decisions on personnel cross training and manning implications are applicable to the DECAID system.

#### 4.1.2 VENM

##### References:

Blacksten, H. R., et al., (1984), An Estimation of the Effectiveness of Chemical Warhead Hits on Aircraft Carrier, Amphibious and Cruiser/Destroyer Ships, DPG-5-TA-8401, (Secret).

Blacksten, H. R., (1986), CVN-68 Data Base for Chemical Warfare Ship Ventilation Model (VENM), DPG/TA-86/09.

##### Description:

The Chemical Warfare Ship Ventilation Model (VENM) is a computer model used to predict chemical agent concentration and dosage histories inside a ship subjected to a hit by a penetrating chemical warhead or from an external chemical agent cloud. VENM was designed following an evaluation of current chemical warfare ship penetration models and incorporates the best features of those models. VENM features include the following:

- Modularity.
- Structured programming.
- Structured facilities, use of overlays to allow modeling large ships using PC's.
- Data and variable structure facilitating addition or deletion of compartment or air flows.

- Accepts ship vent location inputs developed for arbitrary coordinate system, requiring only that the user define the origin with respect to sea surface, and direction of x-axis relative to stern-to-bow direction.
- Selectable option on dosage achievement level reports.
- Creation of runner file to facilitate sensitivity analysis-type reruns.
- Simplified plume model, tailored to current application.
- Programmed for clarity.
- Careful selection of variable names.
- Use of character flags with YES/NO values for option states.
- Highly structured programming.
- Documented assumptions.

When there was a choice between speed and clarity, clarity was chosen. However, internal annotation indicates principal points and method for speed enhancement.

#### Input:

The input subroutines read in the ship compartment and flow data base, the vent data base, and the agent data base. It converts variables to the meter-mg-sec units used during computation, and performs certain other required data transformations before beginning a program run. The user is then queried to provide the remaining input data required to define a run. Data are those anticipated to be subject to variation from run to run and include attack type, weapon parameters, damage area description, and agent plume parameters. In addition, those parameters defining ship tactical response are input.

**Output:**

The interim and final computer printout reports of the model runs provide the following information:

- All agent transport within the ship and concentrations in all compartments.
- Dosages and determination if agent thresholds have been reached are computed and presented by compartments.
- A table of the concentration and dosage histories over a selected amount of time during the run is provided.
- Dosage thresholds for the people breathing the agent is determined.

The first level of dosage threshold relates the initial effects of the chemical and continues to the fourth level (death) of chemical concentration. Finally, data base information can be printed, if required.

**Validation:**

See classified document, referenced above.

**Comments:**

VENM uses the model DAWN as part of its attack scenario. The DAWN outputs provide the VENM agent concentration inputs at the ship's intakes at selected times. VENM and DAWN were programmed in Microsoft FORTRAN 77 for the IBM PC compatible computers. It should transport, with little problem, to any computer with a FORTRAN 77 compiler using a MicroVax or Vax computer.

**4.1.3 DAWN**

**Reference:**

Guess, A., Wallace, M., Yencha, T.J., Overman, M.E. (1988), Program Maintenance Manual for the Deposition and Weathering of a Chemical Warfare Attack on a Naval Vessel (DAWN) Module, Naval Surface Warfare Center, Dahlgren, Virginia.

Winkler, R. and S. Imhoff (1983), Computer Program for the Prediction of Droplet Persistence on a Moving Vehicle-Weathering Model (VEHW). ARCSL-CR-83013, U.S. Army Armament Research and Development Command, Chemical Systems Laboratory, Aberdeen Proving Grounds, Md.

**Description:**

This model generates data files that are used in describing the vessel surfaces and the characteristics of the airflow about the vessel. This model is made up of eight different modules, each module plays an important role in providing input data to other modules through the use of the output parameters. The cloud tracking consists of an adaptation of the NUSSE II model which describes a falling, evaporating aerosol cloud. The deposition module consists of one program to deposit the agent upon the vessel's surface and provide a time history of the deposition pattern, including concentrations, locations and droplet size. The evaporation or weathering module is an adaptation of the model to predict droplet persistence on a moving vehicle (VEHW). The vent history module includes the vapor cloud data and vent positional data and produce files that describe the primary and secondary agent contamination histories of all the vents as the vapor clouds pass over them.

**Input:**

The inputs for each module of the model are defined for the operator and the operator is queried as to which selections are required to build the appropriate input files. These various inputs are translated into output files and become input to other files generated later in the model development. Figure 5 provides an overview of the relationship of the modules to each other.

**Output:**

A file that contains the quantitative cloud data and positional histories of the chemical cloud as it interacts with the three-dimensional airflow about the naval vessel is generated. The program determines the effects of wind, temperature and surface type upon the evaporation/absorption rates of a given chemical agent. The graphics module generates a three-dimensional display of the vessel and allows utility functions such as normal

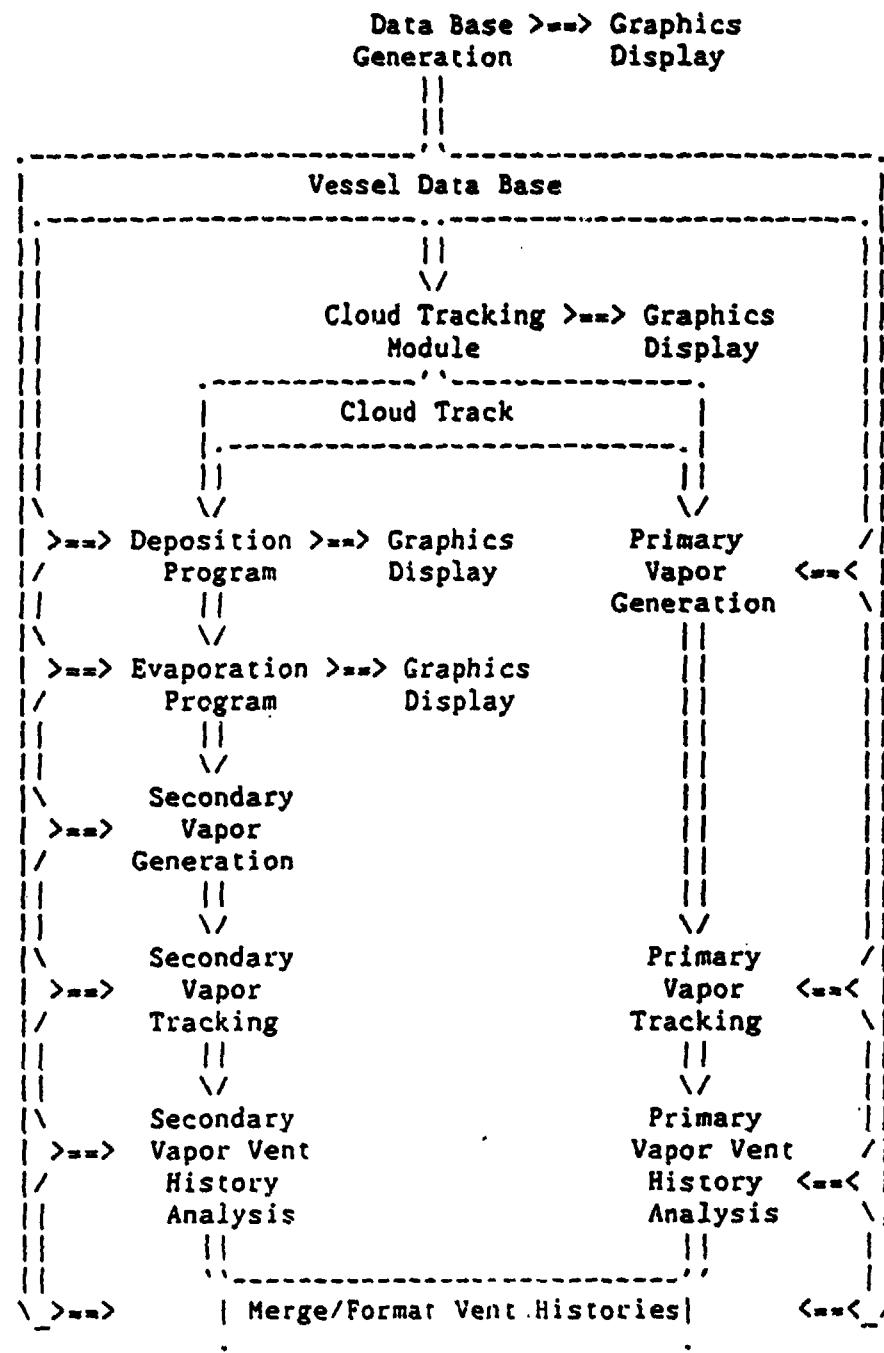


Figure 5. DAWN Module Relationship

vector display, ship surface high-lighting and off-body point display to be made.

**Validation:**

No data available at present.

**Comments:**

DAWN is basically a research tool. The DAWN model runs for several hours on a VAX; this would translate into several hours on a Z-248. Two options are available to DECAID. First, to run DAWN separately from DECAID and store its output as part of the input conditions to a scenario, or, only use a few of applicable DAWN modules for the DECAID system. The decision on the approach will be determined based on the final needs of DECAID. This program was developed using C and FORTRAN 77 computer languages which makes it much simpler to adapt to the DECAID system.

#### 4.1.4 Task Time Multiplier

**References:**

Fleishman, E.A. and Hogan, J.C. (1978), Taxonomic method for assessing the physical requirements of jobs: The physical abilities approach. ARRO Tech Report 3012/R 78-6, Advanced Research Resources Organization, Washington, D.C.  
Fleishman, E.A., (1982), Systems for describing human tasks, American Psychologist, Vol. 37, pp.821-834.

Ramirez, T.L., Shew, R.L., Felt, J.E., Rayle, M.E. (1986), A method for determining task time increase caused by the individual protective ensemble, Armstrong Aerospace Research Lab, Wright Patterson AFB, Dayton, Ohio.

Ramirez, T.L., Rayle, M.E., DaPolito, F., Shew, R.L., (1987), Determination of task time increase caused by the individual protective ensemble, Phase II., Armstrong Aerospace Medical Research Lab, (AAMRL/HET) Wright Patterson AFB, Dayton, Ohio.

### Description:

The task time degradation of human performance in a chemical defense environment is an important criteria for the commander to consider when making mission essential decisions. The review of the literature in the domain of human performance modeling reveals few existing models are available for the calculation of increased time to perform tasks when wearing the MOPP gear. Because of this a requirement to develop a method for determining increased time to perform tasks when wearing the MOPP gear. This modeling effort was initiated by the Air Force. This model attributes task time to specific human abilities; the criticality of those abilities to task performance and the difficulty associated with the wear of the chemical defense ensemble. A performance number is calculated from the criticality and difficulty factors acquired through the use of questionnaire data. Using a conversion scale, which is based on past studies of task time degradation, the performance number is converted to an equivalent Task Time Multiplier (TTM). The average shirt sleeve task time is then multiplied by the TTM to obtain the increased task time due to wearing the chemical defense ensemble.

### Inputs:

The inputs required are the ratings from job incumbents on two questionnaires. The first questionnaire relates the criticality or level of importance of a specific human ability to the task being performed. A second questionnaire asks for the same data after the performance of the task wearing MOPP IV gear. The second questionnaire asks the same human ability questions as the first questionnaire except the level of difficulty to perform the task is rated this time rather than the importance or criticality of the ability. A rating scale of one to five is used. One being less critical or difficult and five being most critical or most difficult. Table 8 provides a table of the categories of human ability and the subcategories for each ability which are assessed using this method. Each subcategory has been defined and the definitions presented below.

#### 1. Audition

Localization: the ability to accurately determine the direction of a sound source. Human discrimination between sound sources located to the right and left of the head is very good even when the head is immobile. Front-

back and up-down discrimination is most often much poorer and more degraded when wearing the hood of the protection garment.

**Sensitivity (auditory):** the absolute discrimination of the human ear as measured by the least sound pressure which leads to a sensation of hearing the normal human ear is maximally sensitive to the frequencies between 100 and 3,000 Hz. Sensitivity falls off above and below this frequency range.

**Response Rate:** Woodworth (1938) and Bailey (1982) note that response to an auditory stimulus is more rapid than reaction to other sensory modalities (pain being the slowest). Humans hear a signal and respond to it, on average, in 150 milliseconds (vision takes 200 ms and pain 700 ms).

**Speech Interference:** The shift downward in threshold of intelligibility of speech due to the presence of other interfering sounds or due to degradation of the speech signal by the mask filtering.

**Intensity (speech signal):** As intensity of speech is increased above threshold, articulation and intelligibility scores increase exponentially. Intensity and speech intelligibility are correlated and intensity can be easily controlled by amplification.

TABLE 8. Categories and Subcategories of Human Abilities

Audition	Dexterity	Psychological Condition
localization	fine motor	stress
sensitivity	manipulation	tension
response rate	fine motor	depression
speech interference	response	anxiety
intensity	fine motor	confusion
	strength	motivation
Cognition	Vision	Physiological Conditions
short-term memory	acuity	fatigue
long-term memory	accommodation	stamina
retention	distance	adaptation
storage	visual perception	
concentration	color discrimination	
attention	peripheral vision	
Communication	Physical Coordination	
understand speech	motor response	
response process	general mobility	
	strength	

## 2. Dexterity

**Fine Motor Manipulation:** Motor coordination usually involves small movements which require extensive precision or speed (or both). Rather than strength, precision of movement is stressed in fine motor tasks.

**Fine Motor Response:** Motor response where the factor of strength is secondary to speed or precision or both. Activity concentrated in the limbs or small musculature such as fingers, as opposed to large musculature such as the trunk or torso. In fine motor response (e.g., typing), timing and precision of movement are emphasized.

**Fine Motor Strength:** Strength concentrated in limbs and other small musculature required for precise movements.

## 3. Psychological Conditions

**Stress:** Any aspect of human activity or of the environment which results in an undesirable effect on the individual. According to McCormick (1976), some sources of stress are: heavy work, immobilization, extreme cold noise, vibration, heat, and sleep loss. One may view stress as a human physiological response to adverse circumstances. The response manifests itself in terms of physiological changes such as increased secretion of adrenaline and other "performance" substances such as catecholamine.

**Tension (muscular):** Increased tension of the skeletal muscle during stress as measured by an electromyograph (EMG). During stressful situations, there are subjective reports of tension, including tightness of neck muscles, leg cramping, stiffness of shoulder muscles, and headache. According to Malmo (1959), persistent muscular tension is one symptom of stress.

**Depression:** An affective state characterized by inactivity, sadness, loss of motivation to initiate activity and persisting autonomic nervous system effects such as insomnia.

**Anxiety:** An unpleasant emotional state accompanied by physiological arousal and ill-defined cognitive elements such as a sense of impending disaster. There is no specific external stimulus for the fear-like states. Thus, anxiety differs from fear in that it is a general or diffuse response without an observable specific stimulus.

**Confusion:** A state characterized by disorganized behavior. a disturbance in the organization and planning of response sequences. Such states of disorganized response may be related to extremely high levels of arousal or brain reticular system activation. Extremely high levels of arousal are known to have devastating effects on performance.

**Motivation:** The reason(s) for a subject's tendency towards action in a given situation. Readiness for activity may be influenced by bodily states of deprivation, incentives, fatigue, drugs, hormones, temperature and emotions. Both ability (learning) and motivation are factors in performance and if either is absent, effective performance does not occur.

#### 4. Cognition

**Short-term Memory:** This term refers to the retention of "new" information over brief intervals of time, for example, up to one minute. Short-term memory has a small capacity (about seven items) and holds material in a relatively less-processed form than long-term memory. The term also applies to a "working" or operational memory that maintains information temporarily activated from long-term memory in the process of solving a particular problem. For example, in adding up the digits of a memorized phone number, it is necessary to keep the digits (and partial sums) available during the course of computing the sum.

**Long-term Memory:** A memory system that keeps information for long periods of time, has a very large capacity, and stores information in a relatively processed form. Long-term memory refers to the relatively permanent component for the human memory system.

**Retention:** The conservation over time of previously learned or acquired information. Retention of information over time is the inverse of forgetting.

**Storage:** The acquisition of information. The learning stage (as opposed to retention and retrieval) of memorizing in which new information is incorporated into long-term memory.

**Concentration:** The ability to sustain attention on a specific task or input channel. Sustained concentration is the ability to maintain a given level of alertness over a long period of time. Concentration is affected by

length of time in a supervisory task, stress, sleep loss, temperature, humidity, and noise.

**Attention:** The process of determining which of many concurrent stimuli will be analyzed and reacted to. Attention refers to the focusing and sequencing of a limited information processing capacity.

## 5. Vision

**Acuity:** The precision with which one can see fine details. Sharpness of sight as measured by the ratio between the distance at which the subject can see a given object and the distance at which a person with normal (20/20) vision can see it.

**Accommodation:** The process by which the lens changes shape in accordance with the distance of the object being viewed. Since the eye can focus sharply on only one object at a time, objects at other distances are defocused and unclear to greater or lesser degrees.

**Distance (judgement):** The ability of an observer to estimate distances of objects. According to Bailey (1982), people tend to underestimate distances. Distance judgement may become very distorted in unusual environments (e.g., space, underwater). For example, the stated distance that expert swimmers judge they travel underwater is very inaccurate.

**Visual Perception:** Awareness of the environment or environmental situations obtained through the interpretation of visual input data.

**Color Discrimination:** The ability to differentiate between colors. Deficiencies in color discrimination (occurring in 8 percent of the male population) may degrade performance in tasks that use color coding if no backup code exists.

**Peripheral Vision:** This term refers to visual function for objects imaged approximately 6 degrees or more from the center of the fixation point. The further the image is from the fovea, the less clearly its shape can be perceived. Form recognition is possible for objects within 6 to 20 degrees from the fovea. Objects in the middle field (20 to 40 degrees) are not seen clearly, by movement and strong visual contrasts (brightness) are noticed. Objects in the outer field (40 to 70 degrees) are not noticed unless they move.

## 6. Communication

**Speech Understanding:** The ability to comprehend human speech. Methods for measuring the efficiency of speech communication are usually obtained by articulation testing procedures. In articulation testing, a speaker reads standardized tests of syllables, words, and sentences to a group of listeners and the percentage of items correctly recorded by these listeners yields an articulation score.

**Response Process:** The efficiency and speed of a listener in responding to speech. Listeners greatly improve with practice in understanding distorted speech or speech heard in the presence of noise. However, there are large individual differences in response to distorted speech.

## 7. Physiological Conditions

**Fatigue:** This term refers to a disinclination for exerting effort and a corresponding drop in efficiency or performance. Both of these conditions are usually relieved by a rest period. The drop in performance is objective, but other subjective symptoms of fatigue are as follows:

- Subjective feelings of weariness and distaste for work.
- Slow or sluggish thinking.
- Lowered level of alertness.
- Slow and degraded perception of situations.
- Unwillingness to continue the work.
- Subjective decline in motor and mental performance.

**Stamina:** The capacity to continue an effort requiring exertion over a lengthy time period.

**Adaptation:** Usually refers to a reduction or loss of sensitivity or responsiveness to stimulation (or unusual stimuli) due to repetitiveness of the situation. For example, one might not notice a loud siren after continued exposure to the sound.

## 8. Physical Coordination:

**Motor response:** This refers to responses involving muscular movements of the striated muscle, as opposed to glands. The term "motor" is

intended to refer to muscular actions and includes both gross and fine motor coordination.

**General Mobility:** The ability to move without limitations. The range of movements may differ for individuals, with slender persons having greater movement range than obese or muscle-bound individuals.

**Strength:** Refers to muscular capacity to exert force under static conditions. Strength may vary with muscle size, body position, motivation, fatigue and other factors.

#### **Output:**

The output of the model provides the analyst with two important pieces of information. These are a measure of approximate time increase to complete a specific task and second, a method of inquiry into exactly which human abilities are being negatively affected by the chemical defense ensemble. The model was developed to determine the increased time to perform a task but, it is also important to understand where the degradation is coming from so that steps may be taken to rectify the problem and by doing so, possibly cut the time increase as well as the possibility for error. Figure 6 provides a presentation of the aggregated data prepared from a questionnaire.

#### **Validation:**

Validation has not been accomplished, verification based on actual field data has been accomplished. Table 9 represents three tasking areas for which actual data have been collected and compared to the data received from the TTM's questionnaire. The data base for this model only has data concerning the MOPP IV configuration. This methodology was supported by a literature review, expert operational knowledge in operation/maintenance and chemical environment, and simulation modeling capabilities.

#### **Comments:**

This model does not calculate heat casualties. Indirectly it does pick up the areas of human performance that are being affected by heat. When the physiological conditions are rated very high on the difficulty questionnaire it can usually be correlated to ambient temperature at the time the task was performed. This model is relatively new and therefore further

**Speciality Code: 47252**  
**Job Name: Vehicle Mechanic**

		TUNING ENGINES		REPAIRING EXHAUST SYSTEMS		REPAIRING SUSPENSION SYSTEMS		REPAIRING ELECTRICAL SYSTEMS		REPAIRING & ADJUSTING BRAKES			
Task Performance		30%	5%	5%	40%	40%	•	4	3.5	3	2.5	2	1.5
Task Percentage		80 min.	150 min.	60 min.	240 min.	240 min.	30 min.	C/F	D/F	C/F	D/F	C/F	D/F
Criticality and Difficulty Factors		C/F	D/F	C/F	D/F	C/F	D/F	C/F	D/F	C/F	D/F	C/F	D/F
<b>Auditory Detection</b>		4.0	4.0										
<b>Cognitive Effects</b>		3.0	3.0										
<b>Communication</b>		2.0	4.0										
<b>Dexterity</b>		4.0	5.0										
<b>Physical Coordination</b>		2.0	3.0										
<b>Physiological Conditions</b>		5.0	5.0										
<b>Psychological Effects</b>		2.0	3.0										
<b>Vision</b>		4.0	5.0										
<b>Product Sum</b>		110											
<b>Criticality Sum</b>		26											
<b>Performance Number</b>		4.23											
<b>Task Time Multiplier</b>		1.97											
<b>Total Increased Time to Perform</b>		157.5 min.											
<b>Conversion Scale</b>								Performance Number TTM	4.5	4	3.5	3	2.5
									2.05	1.9	1.75	1.6	1.45
											1.3	1.3	1.15
												1	1

**Figure 6. Task Time Multiplier Matrix**

research is required to completely understand all the short-comings of the method and how it may be improved.

TABLE 9. Actual Data Versus TTM Data

	Actual Increase Factor	TTM Factors
Munitions	1.47	1.46
Maintenance	1.55	1.5
Civil Engineering	1.63	1.7

#### 4.1.5 PDGRAM

##### References:

Claiborne, J.D. (1979) Mathematical Modeling of Personnel Degradation. Vol. I. Background Information and Theory, US Army Armament Research and Development Command, Aberdeen Proving Ground, Md. 21010.

Claiborne, J.D. (1979) Mathematical Modeling of Personnel Degradation. Volume II. Program Description For PDGRAM, Us Army Armament Research and Development Command, Chemical Systems Laboratory, Aberdeen Proving Ground, Md. 21010

##### Description:

Performance Degradation Program (PDGRAM) is a model which calculates the personnel degradation suffered by military forces engaged in chemical warfare. PDGRAM is a model developed to support performance degradation attributes for the large Army war gaming models. Four potential sources of degradation are considered. They are skill inhibition due to wearing the protective clothing, decreased work/rest ratio due to the inability of the protective suit to dissipate heat, physiological effects of sub-lethal doses of chemical agents, and out of action time due to decontamination procedures. PDGRAM is a cyclic model, going through five phases of operation during an incremental time cycle. The time phases are:

1. Parameter Input,
2. Parameter Modification,

3. Skill Efficiency Calculation,
4. Factor Calculation,
5. Unit Efficiency Calculation.

**Input:**

The input parameters fall into five categories, environmental, unit, agent, decontamination and physiological. Each input parameter can be changed at the beginning of each cycle. The following input variable parameters or ones which may be changed during the program are:

**Environmental Parameters:** There are seven environmental parameters. Three of these are concerned with the solar heat load. The other four are air temperature, relative humidity, wind speed and precipitation (the precipitation value is not used).

**Unit Parameters:** Allow the characterization of the military unit so that it can correspond to almost any type of combat unit with a wide variety of scenarios. There are twenty-two parameters divided into six groups. The first group is the skill factor. The second group is the weighting value applied to each military factor. The number of personnel and the amount of weapons, equipment and transport in the unit make of the third group. Group four is a set of factors which relate to the shelters available for the unit, the warning available prior to an attack, the training level of the unit and the urgency of the tactical situation. The fifth group represents the unit's division into the three MOPP levels, and the sixth group is the desired work rate for the personnel in each MOPP configuration.

**Agent Parameters:** The chemical agent being deployed and its potential effects upon troops are characterized by the agent parameters. The program is designed initially to model three types of agents, GB, VX, and HD. The effects on the various skills is determined by giving each skill a weight by which the overall incapacitative dose,  $I_{ct50}$ , is divided to produce the incapacitative dose for the particular skill.

**Decontamination Parameters:** Characterization of the capabilities of four types of decontamination activities. Each type of activity has three parameters associated with it. The first parameter is the rate at which the specified type of decontamination operates. The units are generally person per hour or square meters of surface area per hour. The second parameter is the

overall capacity for the specified type. The final parameter is the travel time involved in traveling from the job point to a decontamination station and back to the job.

**Physiological Parameters:** The make-up of the average soldier in the unit is described with five physiological parameters, body weight, body surface area, normal body temperature, the specific heat of body tissue, and the energy expenditure rate of the body. Two additional physiological parameters are included which characterize the performance of the individual. They are maximum body temperature and maximum total energy output.

**Attack Parameters:** The effect of a chemical attack on the unit is described by a set of eight parameters. Four of these give the initial concentration of vapor agent in the air and the initial amounts of liquid agent deposited on the ground, on equipment and on personnel after an attack. The initial values are supplied by the operator during an attack cycle, and they represent the maximum concentration expected following an attack. The levels will be reduced as a function of time by evaporation and dissipation as the run continues. The other four parameters are percentage values for the number of personnel who are casualties or are contaminated and for the amount of equipment destroyed or contaminated. Personnel who are casualties or equipment destroyed is lost to the unit for the remainder of the run.

**Time Parameters:** There are three time parameters which are input variables. Two are only set once in the program. They are the initial time of the exercise and the time period for forming the cumulative efficiency value. The duration of the cycle is supplied at the beginning of each cycle. During each cycle, the unit performs or is subject to one of three activities. The possible activities for modification are normal combat activity, receiving a chemical attack and decontamination. The specific activity and the duration of the activity are selected at the beginning of each cycle.

**Constant Parameters:** The constant parameters are values that are established at the beginning of PDGRAM and cannot be altered during the run. These are the chemical agents and protective posture (MOPP level).

**Clothing Parameters:** Each clothing ensemble is characterized by four parameters. These are measures of the insulation, permeability, transmittance, and absorbance of the clothing. These data were taken from studies performed by Goldman at the Natick Laboratory.

**Agent Related Parameters:** The agent related parameters consist of three values for each chemical agent which describe the chemical nature of the agent.

**Skill Related Parameters:** This is a degradation factor on the skills (manual dexterity, visual acuity, aural communication, mental abilities and work/rest ratio) which are impeded when wearing the MOPP gear.

**Output:**

PDGRAM has two kinds of output: those that occur only if the print flag is on and those that occur all the time. Output that occur all the time are the average skill efficiency level for each skill, the factor values for firepower, mobility and C<sup>3</sup> (Command, Communication and Control), and the overall unit efficiencies for both the cycle and the cumulative value. Outputs that occur only when the print flag is on are new parameter inputs, cycle activity description and a complete breakout of the skill calculation results showing the skill efficiency level for each MOPP and skill combination.

**Validation:**

This model has been validated to the level of models used for military performance studies. This means it is only as good as the data collected from various military exercises. Two areas of the model have not been validated because no applicable data are available. These areas are the decontamination process and the incapacitation of the soldier by chemical agents. The model has been designed to incorporate the information, as data become available.

**Comments:**

This model does not calculate heat casualties; it is assumed that the unit commander knows exactly how hard to work the unit while keeping the expected heat casualties below a predetermined level. There are a number of caveats required when using this model. The basic theories and mathematics are acceptable and practical, but there are a number of assumptions which must be made because of the lack of data. Selected modules of this model are usable and should support the DECAID design. This model is PC-based and was developed using Fortran 77.

#### 4.1.6 TCORE

##### References:

- Givoni, B., Goldman, R.F., (1972) Predicting rectal temperature response to work, environment and clothing, Journal of Applied Physiology, Vol. 32, No. 6.
- Wick, C. (1985) Modeling the Phenomenon of Heat Stress (unpublished), Ballistic Research Laboratory, Aberdeen Proving Ground, Md.
- Baldauf, J.J. and Klopacic, J.T. (1983) The Correlation and Modeling of Job Performance Degradation and Heat Stress Probability Due to the Wearing of Chemical Protective Apparel, Ballistic Research Laboratory, Aberdeen Proving Ground, Md.

##### Description:

The TCORE model was developed in 1983 by the US ARMY Ballistic Research Laboratory to assist the US Army Research Institute of Environmental Medicine (USARIEM) with the prediction of thermal effects when wearing the Chemical Defense Ensemble (CDE). Wearing the CDE creates thermal stress by interfering with the body's natural evaporative cooling and heat transfer mechanisms. The models algorithm is based directly on the Givoni-Goldman model equations, which combines thermodynamic balance for the individual with empirical equations based on a regression fit of experimental data and predicts core (rectal) temperature and percent chance of personnel casualties over time. The difference between the TCORE model and the USARIEM model is the level of sophistication of the models. TCORE is not as refined as the model used at USARIEM, since it does not contain the extra subroutines that are contained in the USARIEM models. The TCORE model is also not as specialized as the Whissler model which is used for specific laboratory thermal research of body sections. Although this model is limited, it is of considerable strength and can be accepted as an easy to use method for the support of determination of performance degradation due to the thermal effects of heat. Human core temperatures can be calculated for specific needs using this simple physiological model. For example, one may need to establish predictive workload levels at selected ambient temperatures prior to a field study so that

tasking concepts may be studied prior to actual exercises being performed in MOPP gear.

**Input:**

Environmental condition combinations which equate environmental temperatures to the microclimate and temperature inside MOPP gear are used in TCORE to determine the equilibrium temperature. This temperature rise inside the clothing results from solar insulation and metabolically generated heat. The metabolic rate, in watts, is required as an input to use TCORE.

Using the other required inputs of ambient weather conditions (temperature, relative humidity, wind speed, and solar load) and the clothing conditions ( $Im/CLO$ ), the time to reach a given equilibrium core temperature can be determined.

**Output:**

The output of this model is core temperature as a function of time based on the metabolic rate (workload), CDE thermal characteristics and the environmental factors (ambient temperature, relative humidity). It provides an estimation of the percent probability of becoming a heat casualty and time to reach equilibrium core temperature as shown in Table 10. Equilibrium core temperature is defined as the point at which no change occurs in the state of a system as long as its surroundings are unaltered.

**Validation:**

Validation of the methodology has been accomplished at USARIEM and except at extremely high ambient temperatures the model is a good predictor.

**Comments:**

This model does not consider anything but physiological response to the temperature. It was not designed to interact with the psychological elements of the human. No allowance for hydration or fatigue has been developed, but these two areas are to be incorporated within the next two years. This model was developed by the authors of AURA using the data provided by USARIEM.

Table 10 TCORE Model Run

TCORE

TYPE: S = STOP \* R = RUN \* M = METABOLIC RATE \* T = TEMP. (ATMOS)  
 H = HUMIDITY \* C = CLO, (IM/CLO) \* K = SKIN TEMP. \* A = AREA OF SKIN  
 W = WIND \* G = GAMMA

INTERNAL ( NET ) METABOLIC RATE ( WATTS )

? 250  
 TEMP. OF ATMOS ( DEG. F )  
 ? 80

RELATIVE HUMIDITY ( 0. - 1.0 )  
 ? .8

CLO, ( IM/CLO )  
 ? 2.50, 0.11

OPT. INPUTS: SKIN (TEMP), AREA, WIND, GAMMA, OR NONE  
 ? NONE

INPUT

METABOLIC RATE = 250.00 ATMOS. TEMP { DEG F } = 80.00 HUMIDITY = 80  
 CLO, (IM/CLO) = 2.50 .11 SKIN TEMP { DEG F } = 96.80  
 SKIN AREA (M\*\*2) = 1.80 WIND SPEED { M/SEC } = 2.00 GAMMA = .25

OUTPUT

EQUILIBRIUM CORE TEMP = 102.18 DEG. F PCAS = 22  
 LAG TIME (HR) = .23 TAU(HR) = 1.27

#### 4.1.7 CWTsar

##### Reference:

Emerson, D.E., (1982), TSAR User's Manual: Volume III-Variables and other program aids for the User, N-1822-AF, The Rand Corporation, Santa Monica, Ca.

Hayes, T. R., J.R. Chevalier, C.D. Porter (1987), Chemical Warfare Individual Protective Equipment Baseline Report, Armstrong Aerospace Medical Research Lab, Wright-Patterson Air Force Base, Ohio (Secret).

Porter, C.D., Repolgue, C. (1983), Chemical Warfare Treat Hazard to USAF in Europe, Air Force Aerospace Medical Research Lab. Wright-Patterson AFB, Ohio (Secret/noFORN).

##### Description:

CWTsar is the Chemical Warfare Theater Simulation of Airbase Resources (Figure 7) developed for use by the Air Force. CWTsar is a Monte Carlo discrete event simulation model of air base sortie generation operations in a CW environment. Each CWTsar simulation consists of multiple trials, each trial spanning several days of air base operations and representing a complete Blue and Red scenarios.

##### Input:

This model is based on the Theater Simulation of Airbase Resources developed by the Rand Corporation and adapted to the chemical environment. The inputs are: weapon parameters, meteorological and target data, chemical scenario, conventional scenario, toxicity data, task time degradation and operations data.

##### Output:

Using the models NUSSE II, TSARDOSE, TSARINA and CWTsar the following data are displayed as outputs: cloud data, chemical effects, conventional effects, sortie generation rates and casualties. CWTsar produces several types

of data applicable to analysis of air base operational capability. These data include:

- Aircraft turnaround times.
- Numbers and times of maintenance tasks.
- Causes and durations of task delays.
- Personnel utilization.
- Equipment/parts damage or losses.
- Casualties (conventional, chemical, thermal).

#### Validation:

Validation efforts for CWTsar have not yet been accomplished. The data have been verified by field exercises and the model seems to present good predictions of time increase to perform tasks at different MOPP levels. The threat scenarios have been questioned and the results of chemical casualties expected may need further analysis, but the methods used to calculate these data are well supported by the literature and there is no reason not to apply the methodology to DECAID.

#### Comments:

Some of the structures and algorithms for the files, such as casualty calculation and personnel utilization may be applicable to the needs of this program.

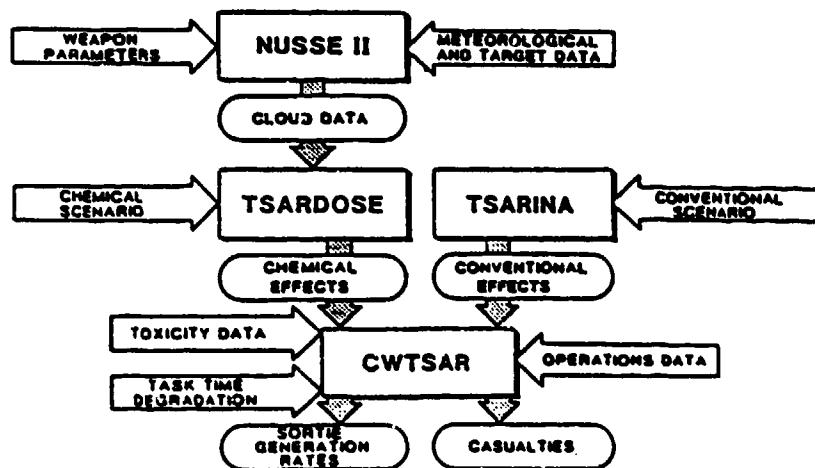


Figure 7. CWSTAR Simulation Model

#### **4.1.8 NUSSE II**

##### **References:**

R. Saucier. "A Mathematical Model of the Atmospheric Transport and Diffusion of a Chemical Contaminant." ARCSL-TR-81071, U.S. Army Armament Research and Development Command, Chemical Systems Laboratory, Aberdeen Proving Ground, Maryland.

##### **Description:**

NUSSE II is the second generation Non-Uniform Simple Surface Evaporation model developed by the U.S. Army. NUSSE II models the atmospheric transport and diffusion of chemical agent from bombs and tactical ballistic missiles (TBMs) using bulk release, and from munitions which use explosive dissemination. The program outputs provide liquid deposition, vapor concentration and dosage patterns for a selected munitions. NUSSE II is a deterministic model; each model run predicts the expected value dissemination pattern of a single munitions for a single set of weather and delivery conditions.

##### **Input:**

The input for NUSSE are the meteorological data concerning the specific area under review. Records of these data have been kept for the past thirty years by different agencies within DOD. These agencies are usually the weather support groups. The specific inputs required are: meteorology, type of agent and attack scenario.

##### **Output:**

The output must be overlaid by other models onto the target of interest (e.g. destroyer aircraft carrier) to represent the effects of multiple munitions, to calculate expected casualties, determine agent persistence with downwind hazard and estimate decontamination requirements.

**Validation:**

This model has been validated based on historical weather data collection data bases and chemical agent studies.

**Comments:**

This model is used as part of AURA (Army), NURA (Navy) and CWTsar (Air Force). It is currently in its third generation and is considered by some to be the best model for describing chemical deposition and dosage patterns.

**4.1.9 TSARDOSE**

**References:**

Jensen, J. (1985) User manual for TSARDOSE, (unpublished), Armstrong Aerospace Medical Research Laboratory, Wright Patterson AFB, Dayton, Ohio.

Middleton, V.E., et.al. (1986) Evaluation of Individual Protective Equipment Improvement Objectives, AAMRL-TR-87-002, Wright Patterson AFB, Dayton, Ohio (Secret).

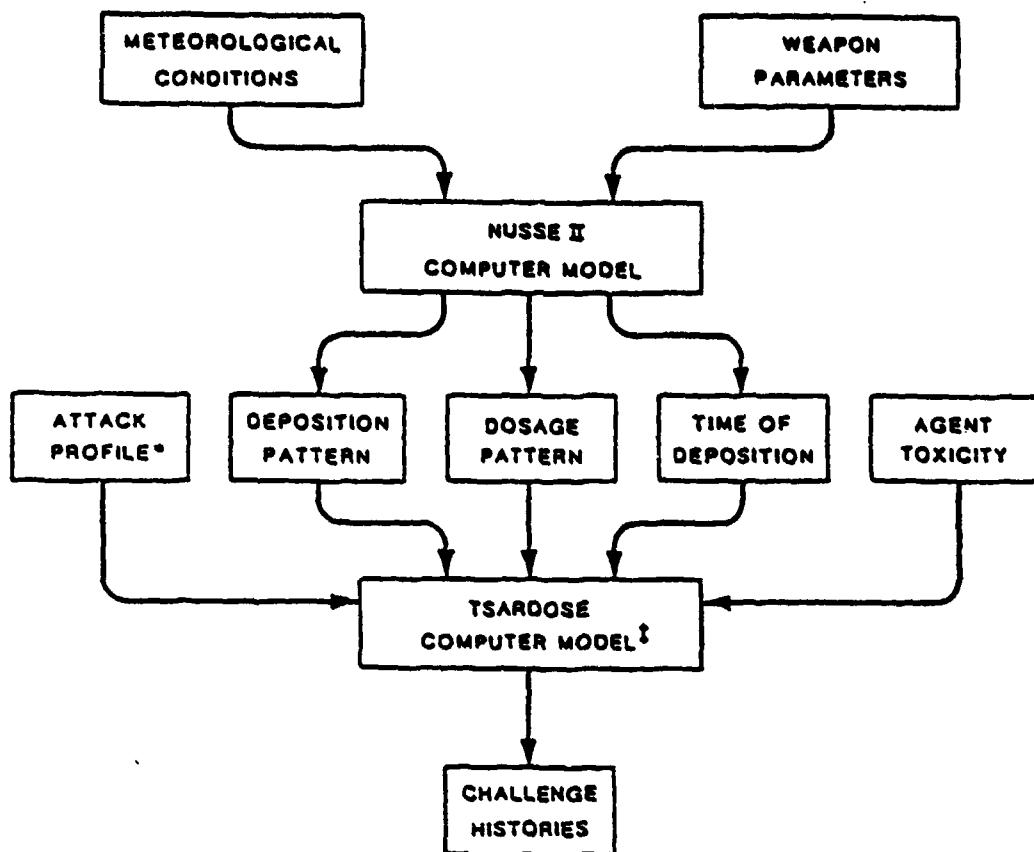
**Description:**

TSARDOSE, as shown in Figure 8, calculates chemical attack descriptions for Chemical Warfare Theater Simulation of Airbase (CWTsar) model. TSARDOSE overlays combinations of NUSSE II output files to represent the multiple munitions and multiple attacks which allows for the design of a more complete CWTsar Red Scenario. TSARDOSE is a Monte Carlo simulation model which provides CWTsar several complete Red Chemical Scenarios, each with different results, which can be used as multiple trials to provide stochastic variability in CWTsar. Within TSARDOSE, random number draws determine munitions delivery errors and the variations in weather.

**Input:**

The inputs to TSARDOSE are meteorological conditions and weapon parameters which support the NUSSE II model. These data are then taken from the NUSSE II output and combined with the attack profile, deposition pattern

dosage pattern, time of deposition and agent toxicity to produce challenge histories.



\* Number of munitions, aim points, munition CEP, air base layout.

† Monte Carlo trials.

Figure 8. TSARDOSE Overview

#### Output:

TSARDOSE output consists of computer files, which serve as input to CWTsar, providing time histories of liquid and vapor chemical agent challenge for designated locations. The basic design of TSARDOSE is applicable to DECAID to provide multiple munitions attack scenarios.

#### Validation:

No data available.

## Comments:

This model was developed to allow for multiple overlays of NUSSE II. NUSSE II only provides single overlays which takes too many computer runs if one wants to provide a true Red Scenario.

## 4.2 RECOMMENDATIONS

Based on this extensive review of the literature in the areas of chemical defense modeling, physiological modeling, human reliability data bases and human performance modeling the following recommendations are made:

- No models currently exist which satisfy all of the requirements for a decision aid for the Damage Control Assistant and therefore, the development of such a model is required.
- Most of the data are available to develop the model, and these data should be incorporated into a decision aid/training system such as DECAID.
- Before these models are designed, the input and output parameters (architecture) and the required format of the parameters for use by DECAID need to be identified and specified.
- The chemical models which should be considered for inclusion into the DECAID system are DAWN, VENM, PDGRAM, TTM, TCORE, NUSSE II, TSARDOSE and selected portions of NURA or CWTsar data bases.
- The TCORE model, based on the work of Givoni-Goldman, should be used to develop a prototype of the DECAID system. This model determines the amount of time required to reach equilibrium temperature when matched to core temperature of known degradation levels would provide predicted performance times for task performance. The core

temperatures can ultimately be combined with existing task performance degradation levels for cognitive, dexterity and psychomotor tasks to determine the maximum working time of personnel when wearing the chemical defense ensemble.

Each of these models contribute to the design for DECAID as displayed in Figure 9. The diagram portrays the design of an overall framework for a human performance prediction system, as presented by Tijerina, et.al. (1988). This system takes into consideration those elements which are required to support the DECAID system using, as support, the theoretical model of the Source-Path-Receiver. This model advocates the Source as being the CBR threat as it reaches the ship and penetrates various compartments; the Path as interaction between the contamination and the crew; and the Receiver as impact to human performance of the Source stressors.

The selected models and data bases fit into this model in the following manner:

SOURCE: CWTsar, DAWN, NURA, VENM, NUSSE II, TSARDOSE, PDGRAM.

PATH: VENM, DAWN, NURA, TCORE, CWTsar

RECEIVER: NURA, TASK TIME MULTIPLIER, TCORE, CWTsar

For the Source of Threats/Hazards data can be taken from CWTsar, VENM and NURA models and their respective data bases. Enough data exist on the properties of the chemical agents to use these models with a high degree of confidence. For Deposition/Weathering DAWN should be used. NUSSE II and TSARDOSE provide meteorological and some climatic data which can be modeled using these models in combination with the data from PDGRAM.

For ventilation dispersal (PATH) the models VENM, DAWN and NURA are acceptable, CDE properties would use TCORE and NURA with support from CWTsar. The Radiation Shielding is not a part of this study and no recommendations for modeling this application are made.

Moving to the RECEIVER portion of the system, heat stress can be modeled using TCORE; Completion Time using the Task Time Multiplier and Task Descriptions taken from the NURA model.

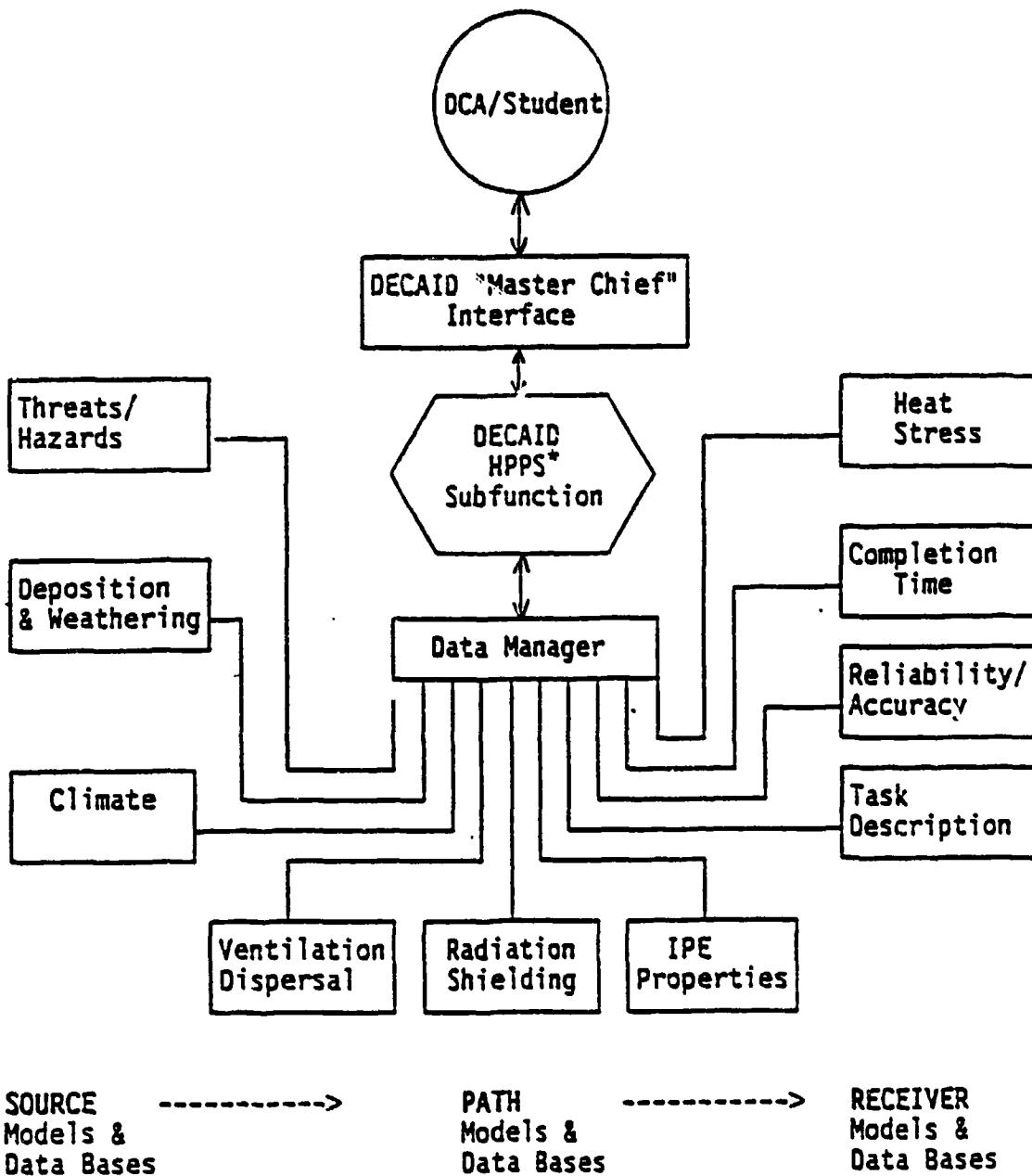


Figure 9. Source-Path-Receiver Model for Human Performance Prediction System

Since little information exists for the reliability/accuracy aspects of wearing the MOPP gear, no model or data base can be recommended for this area. Future studies and data gathering will need to be accomplished before a model or data base is available for this category of performance measurement.

All of these models are not available as a network that could be easily tied to a data manager and accessed when required. There is considerable work to be accomplished before they would actually be usable together in an actual prediction system.

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## GLOSSARY OF TERMS AND ACRONYMS

ABDR:	Aircraft Battle Damage Repair
BDR:	Bomb Damage Repair
CAM:	Chemical Agent Monitor
CBIAC:	Chemical/Biological Information Analysis Center
CDE:	Chemical Defense Ensemble
CHEMCAS:	Chemical Casualty Model
Combiemann:	Computerized Biomechanical Man-Model
CWSPM:	Chemical Warfare Ship Penetration Model
DAWN:	Deposition and Weathering of a Chemical Warfare Attack on a Naval Vessel Model
DCA:	Damage Control Assistant
DECAID:	Tactical Decision Aid
GSSM:	Graphic State Sequence Model
HECAS:	Heat Casualty Assessment Model
HRA:	Human Reliability Analysis
IPE:	Individual Protective Equipment
LCOM:	Logistics Composite Model
MCE:	Maximum Credible Events
MOPP:	Mission Oriented Protective Posture
MTM:	Methods-Time Measurement
NBC:	Nuclear/Biological/Chemical
NPS:	Naval Postgraduate School
SAWE:	Simulation of Air Weapons Effects
TSAR:	Theater Simulation of Airbase Resources
TAWAG:	Tactical Air Warfare Analysis Game
TEPPS:	Technique for establishing Personnel Performance Standards
Therbligs:	A unit of work activity used in time and motion studies
USARIEM:	U.S. Army Research Institute of Environmental Medicine
VENM:	Ship Air Ventilation Model

**APPENDIX A**  
**HUMAN PERFORMANCE ABSTRACTS**

TITLE: THE EFFECTS OF DRUGS ON HUMAN PERFORMANCE: THE DEVELOPMENT OF ANALYTICAL METHODS AND TESTS OF BASIC HUMAN ABILITIES, AIR-IROB/E-25-TR-2

AUTHOR: W.J. BAKER, E.H. ELKIN, H.P. VAN COTT, E.A. FLEISHMAN

ORIGINATING ORG: US ARMY EDGEWOOD ARSENAL RESEARCH LABORATORIES, EDGEWOOD ARSENAL, MD; CONTRACTOR: AMERICAN INSTITUTES FOR RESEARCH, SILVER SPRING, MD

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 66/03/31

COMMENTS: THIS REPORT IS THE SECOND PART OF A STUDY TO DEVELOP A COMPREHENSIVE HUMAN PERFORMANCE TEST BATTERY. TWELVE MICROGRAM/KILOGRAM IM SCOPOLAMINE WAS USED AS THE DRUG FOR EXPERIMENTATION. THIS PAPER INCLUDES THE RESULTS OF TWO STUDIES EXAMINING VISUAL ACUITY, VARIOUS MEASURES OF STRENGTH AND DEXTERITY, REACTION TIME, MEMORY, AND EQUILIBRIUM. DETAILED DESCRIPTIONS OF THE VARIOUS TESTS (EIGHTEEN TOTAL) ARE INCLUDED.

DDC: AD480977

BIBLIOGRAPHY CITE: BAKER, W.J., ELKIN, E.H., VAN COTT, H.P., AND FLEISHMAN, E.A., THE EFFECTS OF DRUGS ON HUMAN PERFORMANCE: THE DEVELOPMENT OF ANALYTICAL METHODS AND TESTS OF BASIC HUMAN ABILITIES, IR-IROB/E-25-TR-2, EDGEWOOD ARSENAL RESEARCH LABORATORY, EDGEWOOD ARSENAL, MD, MARCH 1965

TITLE: GUIDE FOR OBTAINING AND ANALYZING HUMAN PERFORMANCE DATA IN A MATERIEL DEVELOPMENT PROJECT, TECHNICAL MEMORANDUM 29-76

AUTHOR: B.L. BERSON, W.H. CROOKS

ORIGINATING ORG: US ARMY HUMAN ENGINEERING LABORATORY, ABERDEEN PROVING GROUND, MD;

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 76/09/01

COMMENTS: THIS REPORT WAS DEVELOPED FOR CONTRACTOR HUMAN FACTORS ENGINEERING PERSONNEL, CONTRACT MONITORS, AND PROGRAM MANAGERS. GUIDELINES PER DI-H-7058 ARE PRESENTED ON HOW TO CONDUCT HFE TESTS. EXAMPLES OF HFE TEST REPORTS OF SYSTEM IN EXPERIMENTAL PROTOTYPE AND ADVANCED DEVELOPMENT PROTOTYPE DISCUSSES HFE TESTING USE TO INCREASE OVERALL SYSTEM RELIABILITY AND EFFECTIVENESS. LOGISTICS SUPPORT ANALYSIS FOR THE ARMY IS DISCUSSED, HUMAN PERFORMANCE ANALYSIS AND OTHER HFE TOPICS.

DDC: ADA071196

TITLE: REPEATED MEASURES OF HUMAN PERFORMANCE: A BAG OF RESEARCH TOOLS, NBDL-81R011

AUTHOR: A.C. CITTNER, R.C. CARTER

ORIGINATING ORG: NAVAL BIODYNAMICS LABORATORY (NBDL), NEW ORLEANS, LA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 81/11/13  
COMMENTS: RESEARCH TOOLS ARE DESCRIBED FOR USE WITH REPEATED MEASURES OF HUMAN PERFORMANCE FOR MOTION AND VIBRATION. FIRST, STATISTICAL CRITERIA FOR TASKS ARE DELINEATED, TOOLS FOR ASSESSMENT ARE DESCRIBED AND EXAMPLES ARE GIVEN. SECOND, MULTIPLE SUBJECT AND SINGLE SUBJECT ANALYSES OF INTERVENTION EXPERIMENTS ARE CONSIDERED WITH FOCUS ON METHODOLOGICAL TOOLS. LARGE REFERENCE LIST FOR STATISTICAL ANALYSES.

DDC: A113954  
SOURCE: DTIC

TITLE: PERFORMANCE EVALUATION TESTS FOR ENVIRONMENTAL RESEARCH (PETER): EVALUATION OF 112 MEASURES, NBDL-84-R006

AUTHOR: A.C. BITTNER, R.C. CARTER, R.S. KENNEDY, M.M. HARBESEN, M. KRAUSE

ORIGINATING ORG: NAVAL BIODYNAMICS LABORATORY, NEW ORLEANS, LA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 84/09/01  
COMMENTS: THE PURPOSE OF THIS STUDY WAS TO REVIEW 112 DIFFERENT METHODS FOR ACCESSING HUMAN PERFORMANCE. PRESENTS A LISTING OF THE TESTS AND REVIEW OF THE TESTS FOR REPEATED MEASURES APPLICATIONS. THE TESTS WERE PLACED INTO THREE CATEGORIES: 1) RECOMMENDED (30), 2) ACCEPTABLE-BUT-REDUNDANT (15), MARGINAL (35), AND UNACCEPTABLE (32).

DDC: ADA152317

TITLE: IMMEDIATE EFFECTS ON HUMAN PERFORMANCE OF A 1,5-BENZODIAZEPINE (CLOBAZAM) COMPARED WITH THE 1,4-BENZODIAZEPINES, CHLORDIAZEPOXIDE HYDROCHLORIDE AND DIAZEPAM

AUTHOR: R.G. BORLAND, A.N. NICHOLSON

ORIGINATING ORG: ROYAL AIR FORCE INSTITUTE OF AVIATION MEDICINE, FARNBOROUGH, HAMPSHIRE, ENGLAND

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 74/11/26  
COMMENTS: THIS DOCUMENT IS ABOUT AN EXPERIMENT TO DETERMINE THE EFFECTS OF SEVERAL BENZODIAZEPAMS ON HUMAN PERFORMANCE. FIVE HUMAN SUBJECTS WERE TESTED USING ADAPTION TRACKING AND REACTIONS WERE MEASURED AFTER BEING GIVEN EITHER PLACEBO OR ONE OF THREE BENZODIAZEPAMS. THE RESULTS OF THE TESTS ARE GIVEN. SOURCE: BRITISH JOURNAL OF CLINICAL PHARMACOLOGY, VOL. 2, PAGES 215-221 (1974)

TITLE: CLASSIFIED TITLE, CDE-TP-137  
AUTHOR: D.H. BRENNAN, R.W. KEMP, R.J. MOYLAN-JONES  
ORIGINATING ORG: CHEMICAL DEFENCE ESTABLISHMENT(CDE), ENGLAND  
CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 73/10/01  
COMMENTS: GOOD, CONTAINS INFORMATION ON TYPES OF MEASUREMENT OF VISUAL PERFORMANCE AND ESTIMATES OF THE EFFECTS OF GB, (SARIN), ON HUMAN VISION.  
DOC: AD597003

TITLE: THE EFFECTS OF CHEMICAL, BIOLOGICAL CLOTHING, AND EQUIPMENT ON US ARMY SOLDIER PERFORMANCE: A CRITICAL REVIEW OF THE LITERATURE (A PRELIMINARY SURVEY), HEL-TM-12-80  
AUTHOR: J. L. CARR, B.M. CORONA, S.E. JACKSON, V.L. BACHOVCHIN  
ORIGINATING ORG: ANDRULIS RESEARCH CORPORATION, BETHESDA, MD FOR US ARMY HUMAN ENGINEERING LABORATORY (HEL), ABERDEEN PROVING GROUND, MD  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 80/07/01  
COMMENTS: THIS SURVEY REPORTS THE RESULTS OF A SEARCH OF LITERATURE DEALING WITH THE EFFECTS OF THE USE OF CHEMICAL AND BIOLOGICAL CLOTHING AND EQUIPMENT ON MISSION PERFORMANCE OF THE US ARMY SOLDIER. PERFORMANCE OF THE SURVEY REQUIRED THE SEARCH FOR, ACQUISITION OF, AND CATEGORIZATION OF RELEVANT EXISTING LITERATURE. THE SURVEY DESCRIBES THE METHODOLOGY EMPLOYED IN THE SEARCH, LISTS THE SOURCES VISITED DURING THE SEARCH, PRESENTS A REPRESENTATIVE LIST OF STUDIES DEALING WITH PERIPHERAL ASPECTS OF THE SEARCH, AND LISTS TEN TESTS WHICH WARRANT FURTHER EXAMINATION TO MEET THE BASIC OBJECTIVE OF THE US ARMY HUMAN ENGINEERING LABORATORY.  
DOC: ADB050885  
SOURCE: DTIC

TITLE: THE EFFECTS OF CB CLOTHING AND EQUIPMENT ON US ARMY SOLDIER PERFORMANCE; A CRITICAL ASSESSMENT OF PERFORMANCE TESTING, HEL-TM-25-80  
AUTHOR: J.L. CARR, S.E. JACKSON, R.L. KERSHNER, B.M. CORONA  
ORIGINATING ORG: US ARMY HUMAN ENGINEERING LABORATORY (HEL), ABERDEEN PROVING GROUND, MD  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 80/11/01  
COMMENTS: THE US ARMY HUMAN ENGINEERING LABORATORY IDENTIFIED A NEED FOR INFORMATION ON PREVIOUS CHEMICAL AND

BIOLOGICAL (CB) PERFORMANCE TESTING TO IDENTIFY DEFICIENCIES IN EXPERIMENTAL DESIGN AND PROCEDURES, TO AID IN IDENTIFYING DATA VOIDS, AND TO ELIMINATE REDUNDANT TESTING. THE OBJECTIVE OF THIS REPORT IS TO PROVIDE A CRITICAL AND OBJECTIVE ASSESSMENT OF THE TESTS LISTED IN THE PREVIOUS REPORT. THE ASSESSMENT WILL IDENTIFY DATA GAPS AND VOIDS AND WILL EVALUATE EXPERIMENTAL DESIGN, VALIDITY, AND RELIABILITY OF CONCLUSIONS.

DDC: ADB054084

TITLE: HUMAN PERFORMANCE TESTS FOR REPEATED MEASUREMENTS:  
ALTERNATE FORMS OF EIGHT TESTS BY COMPUTER,  
NBDL-82R003

AUTHOR: R.C. CARTER, E.H. SBISA  
ORIGINATING ORG: NAVAL BIODYNAMICS LABORATORY, NEW ORLEANS, LA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 82/01/01

COMMENTS: THE PROBLEM ADDRESSED IN THIS DOCUMENT IS REPEATED MEASUREMENTS OF HUMAN PERFORMANCE. REPEATED MEASUREMENTS USUALLY CANNOT BE MADE WITH THE SAME TEST BECAUSE SUBJECTS ARE INFLUENCED BY PREVIOUS RESPONSES. FORTRAN PROGRAMS CAPABLE OF GENERATING ALTERNATE, YET EQUIVALENT TEST FORMS ARE DESCRIBED. THE TESTS WERE GENERATED ON PAPER BY COMPUTERIZED SAMPLING OF ITEMS AND WERE MODELED AFTER TESTS WHICH HAVE BEEN REPORTED AS USEFUL IN THE LITERATURE OF PERFORMANCE TESTING.

DDC: ADA115021

TITLE: FINAL REPORT, DEVELOPMENT TEST II (PQT-G) OF XM207 CHEMICAL ATTACK WARNING TRANSMISSION SYSTEM (CAWTS),  
USATTC-820602

AUTHOR: J.M. CATELDGE, R.J. GORAK, W.A. DEMENT  
ORIGINATING ORG: US ARMY TROPIC TEST CENTER, APO MIAMI, FL FOR US ARMY TEST AND EVALUATION COMMAND, ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 82/06/01

COMMENTS: TESTS WERE CONDUCTED TO DETERMINE IF THE XM207 CHEMICAL ATTACK WARNING TRANSMISSION SYSTEM (CAWTS) MEETS REQUIREMENTS FOR SAFETY, TROPIC PERFORMANCE, RELIABILITY, TROPIC STORAGE AND HUMAN FACTORS. THE XM207 FUNCTIONED PROPERLY HOWEVER, IT FAILED TO MEET THE REQUIREMENTS FOR TROPIC STORAGE AND PORTABILITY AS DEFECTS IN THE LID SEALS ALLOWED MOISTURE TO ENTER THE HERMETICALLY SEALED CONTAINER AND THE CONTAINER DOES NOT HAVE A CARRYING CASE OR CLIP TO ATTACH IT TO CLOTHING OR WEB GEAR.

DDC: ADB068964

TITLE: IMMEDIATE AND RESIDUAL EFFECTS IN MAN OF THE  
METABOLITES OF DIAZEPAM

AUTHOR: C.H. CLARKE, A.N. NICHOLSON

ORIGINATING ORG: ROYAL AIR FORCE INSTITUTE OF AVIATION MEDICINE,  
FARNBOROUGH, HAMPSHIRE

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 78/01/01

COMMENTS: THIS IS A STUDY OF THE EFFECTS OF DIAZEPAM ON HUMAN  
PERFORMANCE. DIFFERENT DOSES OF DIAZEPAM WERE GIVEN  
AND SUBJECTS WERE TESTED REGARDING PSYCHOMOTOR  
PERFORMANCE SKILLS. STUDIES SHOWED THERE MAY BE  
LIMITED EFFECTS ON PERFORMANCE.

SOURCE: BRITISH JOURNAL OF CLINICAL PHARMACY, 1978, VOL. 6,  
583-589

TITLE: SELECTION OF A HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC  
CLEANUP PROCEDURE FOR THE DETERMINATION OF  
ORGANOCHLORINE PESTICIDES IN FATTY BIOLOGICAL EXTRACTS

AUTHOR: J. DEMETER, A. HEYNDRICKX

ORIGINATING ORG: DEPARTMENT OF TOXICOLOGY, STATE UNIVERSITY OF GHENT,  
GHENT, BELGIUM

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 79/01/01

COMMENTS: THIS PAPER DESCRIBES TWO HIGH PERFORMANCE LIQUID  
CHROMATOGRAPHIC (HPLC) CLEANUP METHODS FOR DETECTING  
IMPURITIES IN HUMAN BIOSAMPLES SUCH AS LIVER OR  
KIDNEY. THE METHODS ARE ABSORPTION CHROMATOGRAPHY A  
NON-AQUEOUS REVERSED-PHASE CHROMATOGRAPHY. IMPURITIES  
STUDIED INCLUDE POLAR ORGANOCHLORINE PESTICIDES  
(BETA-ENDOSULFAN AND ENDOSULFAN SULFATE). BOTH METHODS  
HAD ADVANTAGES AND DISADVANTAGES AND NEITHER ONE WAS  
COMPLETELY SUCCESSFUL IN ITS DETECTION METHOD. THE  
REPORT CONCLUDES THAT IMPURITIES CAN PROBABLY BEST BE  
DETECTED WITH A METHOD UTILIZING PERFORMANCE GEL  
PERMEATION CHROMATOGRAPHY, BUT THIS METHOD AS NOT  
TESTED HERE.

SOURCE: VETERINARY AND HUMAN TOXICOLOGY, VOL. 21, SUPPLEMENT,  
1979, PP. 151-155

BIBLIOGRAPHY CITE: DEMETER, J. AND HEYNDRICKX, A., "SELECTION OF A HIGH  
PERFORMANCE LIQUID CHROMATOGRAPHIC CLEANUP PROCEDURE  
FOR THE DETERMINATION OF ORGANOCHLORINE PESTICIDES IN  
FATTY BIOLOGICAL EXTRACTS," VETERINARY AND HUMAN  
TOXICOLOGY, VOL. 21, SUPPLEMENT, PP. 151-155, 1979

TITLE: OPERATIONAL FEASIBILITY TEST OF THE CHEMICAL AGENT  
MONITOR (CAM), 4-OTN939

AUTHOR: J.F. DOUGLAS, S.M. WILSON, R. PEREZ

ORIGINATING ORG: US ARMY ARMOR AND ENGINEER BOARD, FORT KNOX, KY

CLASSIFICATION: CONFIDENTIAL

DOCUMENT DATE: 84/10/31  
COMMENTS: REPORTS ON TESTS PERFORMED TO ASSESS THE OPERATIONAL EFFECTIVENESS OF THE CHEMICAL AGENT MONITOR (CAM). TESTING INCLUDED PREOPERATIONAL INSPECTION, TRAINING, OPERATIONAL PERFORMANCE, RELIABILITY, AVAILABILITY, MAINTAINABILITY, LOGISTICAL SUPPORT, HUMAN FACTORS, AND SAFETY. A NUMBER OF TEST CRITERIA WERE NOT MET, IDENTIFYING SEVERAL SHORTCOMINGS IN THE SYSTEM. THE CAM WAS FOUND TO BE EASIER TO USE THAN THE M256 KIT AND HAD A MUCH SHORTER RESPONSE TIME.

DDC: ADC036147

TITLE: THE EFFECTS OF DRUGS ON HUMAN PERFORMANCE: ANALYTIC TECHNIQUES, NEW TEST DEVELOPMENT, AND FURTHER STUDIES  
AUTHOR: E.H. ELKIN, W.J. BAKER, H.P. VAN COTT, E.A. FLEISHMAN  
ORIGINATING ORG: AMERICAN INSTITUTE FOR RESEARCH, SILVER SPRINGS, MD, FOR EDGEWOOD ARSENAL RESEARCH LABORATORY, EDGEWOOD ARSENAL, MD  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 66/08/01  
COMMENTS: THIS REPORT SUMMARIZES AN EFFORT WHICH DEVELOPED A COMPREHENSIVE TEST BATTERY WITH WHICH TO STUDY THE EFFECTS OF DRUGS ON HUMAN PERFORMANCE. THESE TESTS ASSESSED VISUAL ACCURACY, MANUAL DEXTERITY, STATIC STRENGTH, GROSS BODY EQUILIBRIUM AND SHORT TERM MEMORY, AND TIME ESTIMATION. THE TEST BATTERY INCLUDED BLOOD PRESSURE, PULSE RATE, RESPIRATORY RATE, PUPIL SIZE, AUXILIARY TEMPERATURE, HAND GRIP TEST AND AUDITORY NUMBER SPAN.

TITLE: A MULTIPLE-TASK PERFORMANCE BATTERY PRESENTED ON A CRT  
AUTHOR: H.H. EMURIAN  
ORIGINATING ORG: DIVISION OF BEHAVIORAL BIOLOGY, THE JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 78/04/15  
COMMENTS: A MINICOMPUTER CONTROLLED BATTERY OF TASKS IS PROVIDED WHICH CAN BE PRESENTED INDIVIDUALLY OR IN COMBINATION ON A SINGLE PERIPHERAL DEVICE, A CATHODE RAY TUBE (CRT), AND WHICH USES THE ACCOMPANYING KEYBOARD AS THE OPERATOR'S CONSOLE. THE BATTERY IS COMPOSED OF THE FOLLOWING FIVE TASKS WHICH REPRESENT MAJOR DIMENSIONS OF COMPLEX HUMAN PERFORMANCE: (1) ABILITY MONITORING, (2) ARITHMETIC OPERATIONS, (3) TARGET IDENTIFICATION, (4) WARNING LIGHT MONITORING, AND (5) BLINKING LIGHT MONITORING. THIS SYSTEM SHOWS THAT A COMPUTER BASED CRT DISPLAY FACILITY CAN PROVIDE, IN A SINGLE INSTRUMENTATION COMPLEX, ALL OF THE ADVANTAGES OF

THE SEVERAL SEPARATE PACKAGES CURRENTLY FOUND IN PERFORMANCE ASSESSMENT BATTERIES AND, MORE IMPORTANTLY, ADD A FLEXIBILITY OF INPUT AND OUTPUT CONTROL THAT HAS NEVER BEFORE BEEN POSSIBLE.

DDC: ADA054170

TITLE: DEVELOPMENT OF A TAXONOMY OF HUMAN PERFORMANCE: A REVIEW OF DESCRIPTIVE SCHEMES FOR HUMAN TASK BEHAVIOR, AFOSR-69-1406-TR

AUTHOR: A.J. FARINA

ORIGINATING ORG: AMERICAN INSTITUTES FOR RESEARCH, PITTSBURGH, PA FOR US AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR), ARLINGTON, VA

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 69/01/01

COMMENTS: THIS REPORT REVIEWS A NUMBER OF SCHEMES DESIGNED TO DESCRIBE THE HUMAN BEHAVIOR OCCURRING DURING TASK PERFORMANCE. THE PURPOSE OF THE REVIEW WAS TO ASSESS WHETHER SUCH SCHEMES WOULD BE USEFUL IN CLASSIFYING TASKS. INCLUDED IN THE REVIEW WERE SCHEMES WHICH EMPLOYED SUCH CONCEPTUAL UNITS AS FUNCTIONS, ABILITIES AND OVERT BEHAVIORS. THE LOGIC OF DESCRIBING TASKS IN BEHAVIORAL TERMS IS EXAMINED WITH A FINAL CONCLUSION BEING REACHED THAT TASKS ARE MORE APPROPRIATELY DESCRIBED IN TERMS OF NON-BEHAVIORAL TASK CHARACTERISTICS.

DDC: AD689412

SOURCE: DTIC

TITLE: F-15C MISSION/TASK ANALYSIS (QUANTIFICATION OF HUMAN PERFORMANCE IN A CHEMICAL WARFARE ANALYSIS), SUPPLEMENT A-F

AUTHOR: J. FITZGERALD

ORIGINATING ORG: MCDONNELL DOUGLAS CORPORATION, ST. LOUIS, MISSOURI  
CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 81/06/01

COMMENTS: THIS DOCUMENT IS AN ANALYSIS PERFORMED UNDER CONTRACT ENTITLED "QUANTIFICATION OF HUMAN PERFORMANCE IN A CHEMICAL WARFARE ENVIRONMENT". SUPPLEMENT A IS THE SELECTION OF MACS II AND COMPARISON WITH MACS IV; SUPPLEMENT B IS THE F-15C MISSION/TASK ANALYSIS; SUPPLEMENT C SHOWS THE ATTACK PROFILE; SUPPLEMENT D LISTS COMPUTER PROGRAM SPECIFICATIONS; SUPPLEMENT E CONTAINS COMMON MEASURE TRANSFORMATIONS; SUPPLEMENT F DESCRIBES THE EXPERIMENTAL DESIGN. TWO ADDITIONAL SUPPLEMENTS SHOW THE LOGIC OF THE SENSITIVITY ANALYSIS AND THE ELEMENTS OF EXPERIMENTAL PLAN FOR CHEMICAL DEFENSE.

TITLE: DEVELOPMENT OF A TAXONOMY OF HUMAN PERFORMANCE: A REVIEW OF THE SECOND YEAR'S PROGRESS, AFOSR-70-0928TR

AUTHOR: E.A. FLEISHMAN, W.H. TEICHNER, R.W. STEPHENSON

ORIGINATING ORG: AMERICAN INSTITUTE FOR RESEARCH, PITTSBURGH, PA FOR AIR FORCE OFFICE OF SCIENTIFIC RESEARCH, ARLINGTON, VA

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 70/01/01

COMMENTS: THIS IS A REVIEW OF THE SECOND YEAR CONTRACTUAL EFFORT ON THE NEED FOR DIFFERENT TASK TAXONOMIC SYSTEMS TO MEET THE NEEDS OF MILITARY USERS. THREE APPROACHES WERE SELECTED: 1) ABILITY-REQUIREMENT APPROACH, 2) TASK CHARACTERISTICS APPROACH, AND 3) SYSTEMS-LANGUAGE MODEL. FINALLY, A SPECIALLY SELECTED HUMAN PERFORMANCE DATA BASE WAS ASSEMBLED.

DDC: AD705671

TITLE: REQUIRED OPERATIONAL CAPABILITY (ROC) NO. NBC 215.2.1 FOR A CHEMICAL/BIOLOGICAL (CB) PROTECTIVE GARMENT

AUTHOR: R. FRANKLIN

ORIGINATING ORG: US MARINE CORPS, WASHINGTON, DC

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 86/04/16

COMMENTS: THIS ARTICLE ESTABLISHES THE REQUIRED OPERATIONAL CAPABILITIES (ROC) FOR A CHEMICAL/BIOLOGICAL PROTECTIVE GARMENT FOR THE US MARINE CORPS. SPECIFIED PERFORMANCE CHARACTERISTICS INCLUDE PROTECTION FROM LIQUID, AEROSOL, AND VAPOR CHEMICAL AGENTS FOR A MINIMUM OF 24 HOURS AFTER A MINIMUM OF 30 DAYS OF WEAR WHEN CHALLENGED BY 10 GRAMS/SQUARE METER OF THREAT AGENT(S). PHYSICAL, MAINTENANCE AND HUMAN ENGINEERING CHARACTERISTICS ARE SPECIFIED. THE REQUIRED INITIAL OPERATIONAL CAPABILITY IS FISCAL YEAR 1988.

DDC: ADA168649

BIBLIOGRAPHY CITE: FRANKLIN, R., LETTER GIVING "REQUIRED OPERATIONAL CAPABILITY (ROC) NO. NBC 215.2.1 FOR A CHEMICAL/BIOLOGICAL (CB) PROTECTIVE GARMENT," US MARINE CORPS, WASHINGTON, DC, 16 APRIL 1986

TITLE: THE EFFECTS OF AN ORAL DOSE OF OXPRENOLOL ON HUMAN PERFORMANCE

AUTHOR: R. GREEN, J. COOKE, L. MALINS

ORIGINATING ORG: CHEMICAL DEFENCE EXPERIMENTAL ESTABLISHMENT (CDEE), ENGLAND

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 77/01/01

COMMENTS: THIS IS A STUDY OF THE EFFECTS OF OXPRENOLOL, A BETA-ADRENERGIC RECEPTOR BLOCKING AGENT, ON HUMAN PERFORMANCE. SEVERAL DIFFERENT PSYCHOMOTOR TESTS WERE

PERFORMED AND IT WAS FOUND THAT THE DRUG HAD NO SIGNIFICANT EFFECTS ON PERFORMANCE.

TITLE: HUMAN PERFORMANCE AT ELEVATED ENVIRONMENTAL TEMPERATURES, AMRL-TR-73-7

AUTHOR: W.F. GRETER

ORIGINATING ORG: US AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY (AFAMRL), WRIGHT-PATTERSON AFB, OH

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 73/07/01

COMMENTS: THIS IS A REVIEW OF RESEARCH ALREADY DONE ON HUMAN PERFORMANCE AT ELEVATED TEMPERATURES. THE FINDINGS ARE ANALYZED IN FIVE CATEGORIES OF PERFORMANCE MEASUREMENTS: 1) TIME ESTIMATION, 2) REACTION TIME, 3) VIGILANCE AND MONITORING, 4) TRACKING, AND 5) COGNITIVE AND OTHER SKILLED TASKS. EXTENSIVE BIBLIOGRAPHY IS INCLUDED.

BIBLIOGRAPHY: AAMRL-TR-87-006

DDC: AD764307

SOURCE: DTIC, AEROSPACE MEDICINE 1973 JULY; 44(7): 747-755

BIBLIOGRAPHY CITE: GRETER, W.F., "HUMAN PERFORMANCE AT ELEVATED ENVIRONMENTAL TEMPERATURES," AMRL-TR-73-7, AEROSPACE MEDICINE VOL. 44, NO. 7, PP. 747-755, JULY 1973.

TITLE: PRELIMINARY ASSESSMENT OF THE EFFECT OF CB PROTECTIVE ENSEMBLES MOPP IV POSTURE ON THE PERFORMANCE OF SEDENTARY AND MODERATELY ACTIVE SOLDIERS IN A TROPICAL ENVIRONMENT, TECHNICAL NOTE 5-82

AUTHOR: W.E. HANLON, D.R. JONES, R.P. MERKEY

ORIGINATING ORG: US ARMY HUMAN ENGINEERING LABORATORY, ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 82/05/00

COMMENTS: THIS DOCUMENT CONTAINS A PRELIMINARY ASSESSMENT OF THE EFFECT OF THREE DIFFERENT CHEMICAL-BIOLOGICAL (CB) PROTECTIVE ENSEMBLES ON HUMAN PERFORMANCE IN A TROPICAL ENVIRONMENT. THE ENSEMBLES CONSIDERED WERE STANDARD ARMY FATIGUES WITH ASSAULT GEAR, A US CB PROTECTIVE ENSEMBLE, AND AN UK PROTECTIVE ENSEMBLE. THE OBJECTIVE OF THE STUDY WAS TO DETERMINE THE PHYSICAL PERFORMANCE CAPABILITY OF MALE AND FEMALE SOLDIERS IN CONDUCTING 200 METER SIMULATED ASSAULTS WHILE WEARING THE RESPECTIVE ENSEMBLES. DUE TO PROCEDURAL CHANGES AFTER THE FIRST DAY OF TESTING, AND PRECAUTIONS ESTABLISHED TO PROTECT THE TEST PARTICIPANTS FROM HEAT RELATED INJURIES, A STATISTICAL ANALYSIS COULD NOT BE PERFORMED ON THE PERFORMANCE DATA. NONETHELESS, INFORMATIVE PRELIMINARY DATA DID RESULT. FIVE OF THE TEST PARTICIPANTS WERE

TERMINATED FROM THE STUDY WHEN THEIR CORE TEMPERATURE REACHED OR EXCEEDED AN ESTABLISHED 102 DEGREES F. ALL FIVE OF THESE TEST PARTICIPANTS WERE MALE, AND FOUR WERE WEARING THE US CB ENSEMBLE. IT WAS ALSO OBSERVED THAT A NUMBER OF TEST PARTICIPANTS EXPERIENCED LESS HEAT STRESS WHILE WEARING THE UK CB ENSEMBLE VERSUS THE US CB ENSEMBLE. THE MOST SEVERE HEAT STRESS WAS EXPERIENCED BY THE TEST PARTICIPANTS WHILE SEATED IN A M113 PERSONNEL CARRIER FOR ONE HOUR BEFORE THE ASSAULT.

DDC: ADBQ65600

TITLE: SCIENTIFIC INTELLIGENCE MONTHLY REVIEW  
AUTHOR: R.S. HART, R.L. KRUMM  
ORIGINATING ORG: NATIONAL FOREIGN ASSESSMENT CENTER  
CLASSIFICATION: SECRET  
DOCUMENT DATE: 77/11/30  
COMMENTS: HUMAN FACTORS APPRAISAL OF THE SOVIET VP-1 AIR DEFENSE SYSTEM VAN. THE SYSTEM ACQUIRES EARLY WARNING INFORMATION FROM FORWARD RADAR SITES AND TRANSMITS IT TO THE C3 NETWORK. ALSO CONTAINS ASSESSMENT OF OPERATORS TRACKING PERFORMANCE.

TITLE: HUMAN RESOURCES TEST AND EVALUATION SYSTEM, COMPREHENSIVE HANDBOOK (HRTES), PATR-1057-80-2  
AUTHOR: J.D. KAPLAN, W.H. CROOKS, M.S. SANDERS, R. DECHTER  
ORIGINATING ORG: US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA; CONTRACTOR: PERCEPTRONICS, WOODLAND HILLS, CA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 82/05/01  
COMMENTS: A HANDBOOK DESIGNED TO ASSIST IN EVALUATING PERFORMANCE OF OPERATORS AND MAINTAINERS IN A SYSTEM IN ONE OF THREE WAYS: 1) DEVELOP TEST PLANS TO TEST HUMAN PERFORMANCE, 2) EVALUATE HUMAN PERFORMANCE, 3) DIAGNOSIS CAUSES OF INADEQUATE PERFORMANCE. GOOD TEXTBOOK REFERENCE FOR TEST AND EVALUATION DEVELOPMENT PROCEDURES.  
DDC: ADA115035

TITLE: STUDIES OF PSYCHOMOTOR PERFORMANCE. THE EFFECT OF GB, PTP-842  
AUTHOR: K.H. KEMP, R.J. SHEPHARD  
ORIGINATING ORG: CHEMICAL DEFENCE EXPERIMENTAL ESTABLISHMENT(CDEE), ENGLAND  
CLASSIFICATION: UK RESTRICTED  
DOCUMENT DATE: 63/02/01  
COMMENTS: GB, (SARIN), WAS INHALED BY HUMAN SUBJECTS WHO THEN

PERFORMED 3 TYPES OF PSYCHOMOTOR TASKS - A CONTINUOUS TEST OF SKILL AND PERCEPTION (HEAVY PURSUIT METER), CONTINUOUS TASK OF PERCEPTION, JUDGMENT, MEMORY, LIGHT WRIST MOVEMENT (LIGHT PURSUIT METER), AND FINE MOTOR COORDINATION (BALL BEARING PICKING). PERFORMANCE OF TEST GROUP (INHALATION OF GB, (SARIN), IN ISOPROPANOL VAPOR) AND TREATED CONTROL (INHALATION OF ISOPROPANOL VAPOR) , WERE COMPARED WITH THAT OF UNTREATED CONTROL GROUP.

DDC: AD337548

TITLE: THE DEVELOPMENT OF A NAVY PERFORMANCE EVALUATION TEST FOR ENVIRONMENTAL RESEARCH (PETER), TM-77-01

AUTHOR: R.S. KENNEDY, A.C. BITTNER

ORIGINATING ORG: NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY DETACHMENT, NEW ORLEANS, LA

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 78/01/01

COMMENTS: THIS DOCUMENT DESCRIBES A PROPOSED PLAN FOR DEVELOPING AN EXPERIMENTAL BATTERY TO EVALUATE HUMAN PERFORMANCE CAPABILITIES UNDER CONDITIONS OF ENVIRONMENTAL STRESS. THE ARTICLE ONLY JUSTIFIES THE NEED FOR SUCH A BATTERY AND DESCRIBES PROCEDURES WHICH WOULD BE USED TO CREATE IT. ACTUAL TESTS WHICH WOULD BE USED TO EVALUATE ENVIRONMENTAL STRESSORS ARE NOT SPECIFIED.

DDC: ADA056047

SOURCE: DTIC

TITLE: CORRELATIONS BETWEEN VISUAL TEST RESULTS AND FLYING PERFORMANCE ON THE ADVANCED SIMULATOR FOR PILOT TRAINING (ASPT), AFOSR-TR-82-0740

AUTHOR: R. KEUK, D. REGAN, K.I. BEVERLEY, T. LONGRIDGE  
ORIGINATING ORG: DEPARTMENTS OF PSYCHOLOGY, PHYSIOLOGY/BIOPHYSICS, AND OPHTHALMOLOGY, DALHOUSIE UNIVERSITY, HALIFAX, NOVA SCOTIA, CANADA FOR US AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR), BOLLING AFB, DC

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 81/08/01

COMMENTS: THIS IS A REPORT OF A STUDY PERFORMED AT THE AF HUMAN RESOURCES LABORATORY ADVANCED SIMULATOR FOR PILOT TRAINING (ASPT). THE OBJECTIVE WAS TO FIND A CORRELATION BETWEEN 13 DIFFERENT VISUAL TEST RESULTS AND LOW-VISIBILITY LANDING PERFORMANCE. THE RESULTS ARE GIVEN WITH A DISCUSSION OF SOME OF THE CONCLUSIONS.

DDC: ADA120198

SOURCE: DTIC, AVIATION, SPACE, AND ENVIRONMENTAL MEDICINE, 52(8):455-460, 1981

TITLE: SURVEY OF HUMAN OPERATOR MODELING TECHNIQUES FOR MEASUREMENT APPLICATIONS, AFHRL-TR-78-35

AUTHOR: P.A. KNOOP

ORIGINATING ORG: ADVANCED SYSTEMS DIVISION, AIR FORCE HUMAN RESOURCES LABORATORY, BROOKS AFB, TX

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 78/07/01

COMMENTS: THE PURPOSE OF THIS STUDY WAS TO REVIEW EXISTING HUMAN OPERATOR MODELING TECHNIQUES AND EVALUATE THEIR POTENTIAL UTILITY FOR PERFORMANCE MEASUREMENT APPLICATIONS. DESCRIBES HUMAN OPERATOR MODELLING TECHNIQUES AND ASSESS THEIR APPLICABILITY

TITLE: SOLDIER PERFORMANCE IN CONTINUOUS OPERATIONS: ADMINISTRATIVE MANUAL FOR BRIEFING AND SEMINAR FOR COMMAND AND STAFF PERSONNEL, ARI-RN-85-69

AUTHOR: F. KOPSTEIN, A. SIEGEL, J. CONN, J. CAVINESS, W. SLIFER, H. OZKAPTAN, F. DYER

ORIGINATING ORG: APPLIED PSYCHOLOGICAL SERVICES, INC., WAYNE, PA FOR US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 85/07/01

COMMENTS: DOCUMENT PRESENTS A SYSTEMATIC HUMAN RESOURCES CONSERVATION PROGRAM TO MEET THE DEMANDS OF CONTINUOUS OPERATIONS. TACTICS FOR COUNTERING PERFORMANCE DEGRADATION DURING CONTINUOUS OPERATIONS INCLUDE TASK ROTATION, TASK SHARING USE OF PERFORMANCE SUPPORTS, PROPER MANAGEMENT OF STRESS, AND APPROPRIATE WORK/REST CYCLES. NO DATA ARE PRESENTED.

DDC: ADA160471

SOURCE: KOPSTEIN, F., ET AL., SOLDIER PERFORMANCE IN CONTINUOUS OPERATIONS: ADMINISTRATIVE MANUAL FOR A BRIEFING AND SEMINAR FOR COMMAND AND STAFF PERSONNEL, ARI-RN-85-69, US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA, JULY 1985

TITLE: HUMAN PERFORMANCE IN CONTINUOUS/SUSTAINED OPERATIONS AND THE DEMANDS OF EXTENDED WORK/REST SCHEDULES: AN ANNOTATED BIBLIOGRAPHY, WRAIR-BB-85-1

AUTHOR: G.P. KRUEGER, L. CARDENALES-ORTIZ, C.A. LOVELESS

ORIGINATING ORG: WALTER REED ARMY INSTITUTE OF RESEARCH, WASHINGTON, DC FOR US ARMY RESEARCH AND DEVELOPMENT COMMAND, FORT DETRICK, MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 85/05/01

COMMENTS: THIS ANNOTATED BIBLIOGRAPHY LISTS 399 REFERENCES

CONTAINING RESEARCH DATA, CONCEPTUAL POSITION PAPER AND DIFFERENT METHODOLOGICAL APPROACHES TO STUDYING HUMAN PERFORMANCE IN CONTINUOUS/SUSTAINED OPERATIONS AND EXTENDED WORK/REST CYCLES OR SCHEDULES. THE TIME FRAME COVERED IN THE REFERENCES IS FROM 1940 TO 1985.

DDC: ADA155619

TITLE: FINAL REPORT ON IMPLEMENTATION OF ALSPM IR MODEL MODIFICATIONS  
AUTHOR: H. LAMUTH, M. KLUSE  
ORIGINATING ORG: BATTELLE COLUMBUS LABORATORIES, COLUMBUS, OH FOR AF AVIONICS LABORATORY, WRIGHT-PATTERSON AFB OH  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 79/01/31  
COMMENTS: THIS REPORT PRESENTS A MORE ACCURATE IMPLEMENTATION OF THE USAF ALSPM (AVIONICS LABORATORY SENSOR PERFORMANCE MODEL) USING THE US ARMY'S NVL (NIGHT VISION LABORATORY) AND MRT (MINIMUM RESOLVABLE TEMPERATURE) MODEL. THE REPORT FIRST POINTS OUT THE INADEQUACIES OF HONEYWELL'S ATTEMPT TO EMPLOY MRT CONCEPTS IN DESCRIBING FLIR AND THEN IT DESCRIBES THE CORRECT NVT MRT MODEL FORMULATION. THE REPORT ALSO INCLUDES THE INPUT DATA THAT WAS USED TO VALIDATE THE MRT UPDATE AGAINST THE NVL TEST CASE. MANY USEFUL HUMAN PERFORMANCE REFERENCES ARE INCLUDED.

TITLE: BIOMEDICAL EFFECTS OF CHEMICAL-THREAT-AGENT ANTIDOTE AND PRETREATMENT DRUGS: AN ABSTRACTED BIBLIOGRAPHY, VOLUME I, NAMRL-MONOGRAPH-34  
AUTHOR: J.M. LENTZ, G.G. REAMS, C.A. DEJOHN  
ORIGINATING ORG: NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY, PENSACOLA, FL FOR NAVAL MEDICAL RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 86/04/01  
COMMENTS: EXCELLENT ANNOTATED BIBLIOGRAPHY COVERING PRETREATMENT AND ANTIDOTE DRUGS. FOR EACH DRUG TESTED THE FOLLOWING DATA ARE GIVEN: AUTHORS, REFERENCE, DRUG USED, SUBJECTS (HUMANS, ANIMALS, ETC), PROCEDURES (OR PURPOSE OF RESEARCH), FINDINGS DIRECT AUTHOR QUOTES USED WHEN POSSIBLE), COMMENTS, AND INDEX. INDEX CONTAINS TOPIC AREA DESCRIPTIONS: DRUG (E.G., ATROPINE, OXIME, PYRIDOSTIGMINE, NERVE AGENT, DRUG-OTHER); BIOCHEMICAL DISCIPLINE (E.G., VISION, AUDITORY, SPATIAL, CARDIOPULMONARY, MUSCULOSKELETAL, PERFORMANCE, PHARMACOLOGY, CUTANEOUS, CORTICAL, REVIEW); AND APPLICATION (E.G., HUMAN, NON-HUMAN). EACH DOCUMENT IS NUMBERED AND A SUBJECT INDEX ALLOWS EXAMINATION OF ANY TOPIC LISTED ABOVE UNDER INDEX. MOST REFERENCES ARE JOURNAL ARTICLES.

DDC: ADA176371

BIBLIOGRAPHY CITE: LENTZ, J.M., REAMS, G.G., AND DEJOHN, C.A., BIOMEDICAL EFFECTS OF CHEMICAL-THREAT-AGENT ANTIDOTE AND PRETREATMENT DRUGS: AN ABSTRACTED BIBLIOGRAPHY, VOLUME I, NAMRL-MONOGRAPH-34, NAVAL MEDICAL RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD, APRIL 1986

TITLE: DECISION AIDS IN ESTIMATING PERSONNEL REQUIREMENTS,  
ARRO-3011-FR  
AUTHOR: J.M. LEVINE, S.M. MALLAMAD, E.A. FLEISHMAN  
ORIGINATING ORG: ADVANCED RESEARCH RESOURCES ORGANIZATION, WASHINGTON,  
DC FOR US NAVY PERSONNEL RESEARCH AND DEVELOPMENT  
CENTER, SAN DIEGO, CA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 78/03/01  
COMMENTS: A COMPREHENSIVE FLOWCHART OF FORTY HUMAN ABILITIES,  
INCLUDING DEFINITIONS, DISTINCTIONS, AND EXAMPLES WAS  
DEVELOPED TO IDENTIFY THE HUMAN ABILITIES ESSENTIAL TO  
SUCCESSFUL JOB PERFORMANCE. THREE STUDIES EVALUATED  
THE RELIABILITY OF THE TECHNIQUE FOR DIFFERENT SAMPLES  
OF ANALYSTS AND TYPES OF JOB DESCRIPTIONS. A  
COMPARISON WAS MADE WITH RATING SCALE METHODS  
ASSESSING THE SAME ABILITIES. THE ABILITY ASSESSMENT  
DIAGRAMS PROVED TO BE RELIABLE AND SUPERIOR TO USING  
RATING SCALES TO IDENTIFY ABILITIES REQUIRED BY TASKS  
AND JOBS.  
DDC: ADA066599  
SOURCE: DTIC  
BIBLIOGRAPHY CITE: LEVINE, J.M., MALLAMAD, S.M., AND FLEISHMAN, E.A.,  
DECISION AIDS IN ESTIMATING PERSONNEL REQUIREMENTS,  
3081-3011-FR, US NAVY PERSONNEL RESEARCH AND  
DEVELOPMENT CENTER, SAN DIEGO, CA, MARCH 1978

TITLE: EFFECTS OF REPRESENTATIVE ANTICHOLINERGIC AND  
ANTICHOLINESTERASE DRUGS ON HUMAN LEARNING AND  
RETENTION, EATR 4025  
AUTHOR: H.L. LINSLEY  
ORIGINATING ORG: US ARMY BIOMEDICAL LABORATORY(BML), EDGEWOOD ARSENAL,  
MD  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 66/09/01  
COMMENTS: THE EFFECTS OF SCOPOLAMINE AND PHYSOSTIGMINE UPON  
HUMAN LEARNING AND RETENTION WAS INVESTIGATED. SIX  
GROUPS OF 10 SUBJECTS EACH WERE RANDOMLY ASSIGNED TO  
SIX DIFFERENT DRUG-DOSE CONDITIONS - A SALINE PLACEBO,  
TWO DIFFERENT DOSES OF SCOPOLAMINE AND THREE  
DIFFERENT DOSES OF PHYSOSTIGMINE. ANALYSES OF VARIANCE  
OF THE DATA FROM ACQUISITION AND RETENTION TESTS  
INDICATED THAT THERE WERE NO SIGNIFICANT DIFFERENCES  
IN PERFORMANCE.  
DDC: AD637873

TITLE: A HUMAN FACTORS EVALUATION OF COLD-WET HANDWEAR,  
72-23-PR

AUTHOR: J.M. MCGINNIS, J.M. LOCKHART, C.K. BENSEL

ORIGINATING ORG: US ARMY NATICK LABORATORIES, NATICK, MA

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 7/2/04/01

COMMENTS: THIS IS A REPORT ON HUMAN FACTORS TESTS EVALUATING FIVE TYPES OF COLD-WET HANDWEAR WITH REGARD TO THEIR EFFECTS ON MANUAL PERFORMANCE AND HAND SKIN TEMPERATURE. THE HANDWEAR SYSTEMS INVESTIGATED IN THIS STUDY WERE THE BARE HAND AND AN IMPERMEABLE GLOVE, WITH AND WITHOUT WOOL INSERTS. THE EFFECTS OF THE HANDWEAR ON MANUAL PERFORMANCE WERE DETERMINED FOR FIVE DIFFERENT TASKS INVOLVING MANUAL AND FINGER DEXTERITY.

DDC: AD756417

TITLE: A COMPUTER MODELING PROGRAM FOR ESTIMATION OF PERFORMANCE DEGRADATION FROM SUBLETHAL EFFECTS OF CHEMICAL AGENTS, CRDC-TR-84053

AUTHOR: R.F. MCHUGH, R.J. MIODUSZEWSKI, A.P. MICKIEWICZ, J.H. THOMPSON, J.W. JAMESON, P.A. BROOME, E.G. DAVIS

ORIGINATING ORG: CHEMICAL RESEARCH AND DEVELOPMENT CENTER (CRDC), ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 85/02/01

COMMENTS: THIS REPORT CONCERNED A COMPUTER MODEL DEVELOPED FOR ESTIMATING THE EFFECT OF CHEMICAL AGENT-INDUCED SYMPTOMS ON THE PERFORMANCE OF SPECIFIED MILITARY TASKS AND THE EFFECTS OF CUMULATIVE SYMPTOMS ON MISSION DEGRADATION. THE DATA USED TO DEVELOP AND TEST THE MODEL ARE ESTIMATES OF HUMAN RESPONSES TO VX AND GB. (SARIN) BY THE INHALATION AND INTRAMUSCULAR ROUTES OF EXPOSURE. INCLUDED IS SAMPLE COMPUTER MODEL OUTPUT.

DDC: ADB090870

TITLE: DEVELOPMENT OF A HUMAN PERFORMANCE RELIABILITY DATA SYSTEM, AMRL-TR-71-74

AUTHOR: D. MEISTER, R.G. MILLS

ORIGINATING ORG: BUNKER-RAMO, WESTLAKE VILLAGE, CA FOR AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY (AFAMRL), RIGHT-PATTERSON AFB, OH

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 7/1/06/01

COMMENTS: THIS DOCUMENT EXAMINES THE REQUIREMENTS OF A HUMAN PERFORMANCE RELIABILITY DATA SYSTEM. ONE HUNDRED AND FORTY STUDIES WERE USED TO DEVELOP A HUMAN

PERFORMANCE RELIABILITY TAXONOMY. THE TAXONOMY CAN BE USED TO PREDICT MAN-MACHINE PERFORMANCE BASED ON VISION, AUDITORY PERCEPTION TACTILE PERCEPTION, DISCRETE MOTOR BEHAVIORS, CONTINUOUS MOTOR BEHAVIORS, COGNITIVE BEHAVIORS, COMMUNICATION, ENVIRONMENTAL FACTORS AND TASK PERFORMANCE FACTORS.

DDC:

AD730910

TITLE:  
AUTHOR  
ORIGINATING ORG:

COMPARATIVE ANALYSIS OF HUMAN RELIABILITY MODELS

D. MEISTER

BUNKER RAMO CORPORATION, WESTLAKE VILLAGE, CA FOR NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, DC

UNCLASSIFIED

7/11/30

THE PURPOSE OF THIS STUDY WAS TO DESCRIBE, ANALYZE AND COMPARE AVAILABLE MODELS AND METHODS FOR MAKING QUANTITATIVE PREDICTIONS OF HUMAN PERFORMANCE IN MAN-MACHINE SYSTEMS. THE 22 METHODS REVIEWED WERE DIVIDED INTO THOSE RELATING TO OPERABILITY AND MAINTAINABILITY; OPERABILITY MODELS FURTHER SUBDIVIDE INTO ANALYTIC (NON-SIMULATION) AND SIMULATION MODELS. IT WAS FOUND THAT MOST MODELS ARE REASONABLY EFFECTIVE FOR PREDICTION, BUT ARE LESS EFFECTIVE FOR DESIGN ANALYSIS, SELECTION AND TRAINING PURPOSES.

DDC:

AD734432

TITLE:  
AUTHOR  
ORIGINATING ORG:

SOME EFFECTS OF INJECTION OF ATROPINE SULPHATE IN HEALTHY YOUNG MEN, PTP-514

S. MILES

CHEMICAL DEFENCE EXPERIMENTAL ESTABLISHMENT(CDEE), ENGLAND

UNCLASSIFIED/LIMITED

5/5/10/11

EXPERIMENTS ON HUMAN SUBJECTS WERE CARRIED OUT TO SHOW THE EFFECT OF ATROPINE IN VISUAL MENTAL, PHYSICAL EFFICIENCY, AND TO INVESTIGATE PHYSIOLOGICAL CHANGES. DISTANT VISION AND VISUAL FIELDS ARE NOT Affected BUT SOME RESTRICTION OF NEAR VISION OCCURS. WORK OF MODERATE INTENSITY CAN BE PERFORMED EFFECTIVELY, BUT THERE IS LOSS OF EFFICIENCY IN THE PERFORMANCE OF HEAVY MUSCULAR WORK. PULSE RATE RELEASES, PULSE PRESSURE LOWERS, CARDIAC OUTPUT LOWERS. VASCULAR POOLING OCCURS IN SUBCUTANEOUS VESSELS AND POSSIBLY THE LUNGS, BUT NOT IN THE MUSCLES. CENTRAL NERVOUS SYSTEM CHANGES INVOLVE A STIMULATION OF HIGHER CENTERS WITH POSSIBLE DEPRESSION OF LOWER ONES, FOLLOWED BY A GENERAL DEPRESSION.

DDC:

AD079280

**TITLE:** TASK ANALYSIS FOR WEAPONS SYSTEMS TESTERS: SHORTCUT TO PAYDIRT IN INFLATIONARY TIMES

**AUTHOR:** J.L. MILES

**ORIGINATING ORG:** US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA

**CLASSIFICATION:** UNCLASSIFIED

**DOCUMENT DATE:** 81/01/01

**COMMENTS:** THE DRAFT MILITARY STANDARD ON TASK ANALYSIS WAS CREATED TO BRING BOTH ORDER AND STANDARDIZATION TO THE PROCESS OF DESCRIBING AND DOCUMENTING WHAT THE HUMANS IN A MILITARY SYSTEM ARE REQUIRED TO DO TO MAKE IT FUNCTION PROPERLY. ITS USE PERMITS TESTERS OF MILITARY SYSTEMS TO IDENTIFY QUICLKLY THOSE HUMAN PERFORMANCE CRITERIA CONSIDERED OF PRIMARY IMPORTANCE IN OBTAINING THE FORECAST LEVEL OF SYSTEM EFFECTIVENESS.

**DDC:** ADP001354

**TITLE:** A CHEMICAL DEFENSE (CD) BENCHMARK FOR HUMAN PERFORMANCE ASSESSMENT, TM-HU-577/000/00

**AUTHOR:** R.G. MILLS, E.G. MEYER, A.W. DUNLOSKY

**ORIGINATING ORG:** SYSTEM DEVELOPMENT CORPORATION, DAYTON, OH FOR AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY (AFAMRL), WRIGHT-PATTERSON AFB, OH

**CLASSIFICATION:** UNCLASSIFIED/LIMITED

**DOCUMENT DATE:** 83/10/13

**COMMENTS:** THIS DOCUMENT PROVIDES A BRIEF HISTORY CHEMICAL DEFENSE PROGRAM PROJECT EVENTS (EXPERIMENTS, STUDIES, REVIEWS, AND CONTACTS) SPONSORED BY THE AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY PRIOR TO 1983, AND ADDRESSES THE DEVELOPMENT OF A METHODOLOGY FOR QUANTIFYING THE EFFECTS OF CHEMICAL DEFENSE STRESSORS ON HUMAN PERFORMANCE AND MISSION EFFECTIVENESS. CONCLUSIONS AND RECOMMENDATIONS FOR PROGRAM DIRECTIONS ARE PROVIDED.

**BIBLIOGRAPHY:** AAMRL-TR-85-077, AAMRL-TR-87-006

**BIBLIOGRAPHY CITE:** MILLS, R.G., MEYER, E.G. AND DUNLOSKY, A.W., CHEMICAL DEFENSE (CD) BENCHMARK FOR HUMAN PERFORMANCE ASSESSMENT, TM-HU-577/000/00, AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY (AFAMRL), WRIGHT-PATTERSON AFB, OH, OCTOBER 1983

**TITLE:** DETAILED TEST PLAN, ENGINEERING DESIGN TEST-GOVERNMENT (EDT-G) (TROPIC ENVIRONMENTAL PHASE) OF HYBRID COLLECTIVE PROTECTION EQUIPMENT (HCPE), USATT-C-R-820201

**AUTHOR:** J.B. MYERS, R.J. FUCHS

**ORIGINATING ORG:** US ARMY TROPIC TEST CENTER (USATT-C), APO MIAMI, FL

**CLASSIFICATION:** UNCLASSIFIED/LIMITED

DOCUMENT DATE: 82/03/01  
COMMENTS: A DETAILED TEST PLAN OF THE HYBRID COLLECTIVE PROTECTION EQUIPMENT (HCPE) PROTOTYPES XM23, XM24, AND XM25. AN HCPE IS A POSITIVE PRESSURE SYSTEM WITH A VENTILATED FACEPLATE CAPABILITY. THE REPORT CONTAINS TEST DETAILS PERTAINING TO THE RECEIPT, INSPECTION, PHYSICAL CHARACTERISTICS, TROPIC EXPOSURE, TROPIC PERFORMANCE, RELIABILITY, LOGISTIC SUPPORTABILITY, SAFETY, AND HUMAN FACTORS. APPENDICES ARE INCLUDED RELATING TO CRITICAL ISSUES, TEST CRITERIA, TEST DIRECTIVES, SUPPORT REQUIREMENTS, SCHEDULES, COORDINATION, FAILURE DEFINITION, AND SCORING CRITERIA. TEST DATA FORMS, CHECKLISTS, LOG SHEETS, AND MALFUNCTION/MAINTENANCE DATA FORMS ARE ALSO INCLUDED.

BIBLIOGRAPHY: AAMRL-TR-85-077  
DDC: ADB068265  
SOURCE: DTIC  
BIBLIOGRAPHY CITE: FUCHS, R. J., AND MYERS, J. B., DETAILED TEST PLAN, ENGINEERING DESIGN TEST, GOVERNMENT (TROPIC ENVIRONMENTAL PHASE) OF HYBRID COLLECTIVE PROTECTION EQUIPMENT, TECOM PROJECT NO. 8-ES825-HCP-005, USATTC REPORT 820201, ARMY TROPIC TEST CENTER, FOR CHEMICAL SYSTEMS LABORATORY, ABERDEEN PROVING GROUND, MD, MARCH 1982.

TITLE: FACTORS WHICH ALTER HUMAN PHYSIOLOGICAL RESPONSES DURING EXERCISE-HEAT ACCLIMATION, USARIEM-M-41/85  
AUTHOR: K.B. PANDOLF, M.N. SAWKA, Y. SHAPIRO  
ORIGINATING ORG: US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE (USARIEM), NATICK, MA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 85/09/01  
COMMENTS: THIS ARTICLE ADDRESSES THREE FACTORS WHICH ARE THOUGHT TO ALTER HUMAN PHYSIOLOGICAL RESPONSES DURING EXERCISE-HEAT ACCLIMATION. THESE FACTORS ARE: 1) THE INFLUENCE OF CARDIOVASCULAR ENDURANCE TRAINING, 2) THE PHYSIOLOGICAL COMPARISON BETWEEN GENDERS DURING THE PERFORMANCE OF EXERCISE IN THE HEAT AND 3) THE PHYSIOLOGICAL EFFECTS OF AGING ON EXERCISE-HEAT ACCLIMATION. DOCUMENT SUMMARIZES SEVERAL STUDIES WITH CONFLICTING RESULTS.

DDC: ADA160580  
SOURCE: DTIC

TITLE: A METHOD FOR DETERMINING TASK TIME INCREASE CAUSED BY THE INDIVIDUAL PROTECTIVE ENSEMBLE, AAMRL-TR-86-036  
AUTHOR: T.L. RAMIREZ, R.L. SHEW, J.E. FELT, M.E. RAYLE, G.M. JAMES

ORIGINATING ORG: JAYCOR, DAYTON, OH FOR ARMSTRONG AEROSPACE MEDICAL RESEARCH LABORATORY (AAMRL), WRIGHT-PATTERSON AFB, OH  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 86/06/01  
COMMENTS: THIS STUDY WAS CONCERNED WITH THE DEVELOPMENT OF A METHODOLOGY FOR DETERMINING THE TASK TIME INCREASE FOR AIRCRAFT MAINTENANCE AND MUNITIONS TASK AS THEY APPLY TO THE CWTsar MODEL. THE STUDY INVESTIGATED EACH AIR FORCE SPECIALTY CODE (AFSC) AND EACH TASK PERFORMED BY THAT AFSC INDEPENDENTLY RATHER THAN AN AGGREGATED APPROACH. HUMAN PERFORMANCE CRITERIA; VISION, DEXTERITY, PHYSIOLOGICAL CONDITIONS, PHYSICAL COORDINATION, COMMUNICATION, COGNITIVE EFFECTS, PSYCHOLOGICAL EFFECTS AND AUDITORY DETECTION, SURVEYS GIVEN (5 POINT SCALE). HUMAN PERFORMANCE DATA BASE INCLUDE ABILITIES, CRITICALITY, DIFFICULTY, PERCENTAGE OF TASK, AND BASELINE TIME. METHODOLOGY INCLUDED WITH TASK TIME MULTIPLIER (TTM) MATRIX GLOSSARY AND SAMPLE CALCULATIONS. HUMAN PERFORMANCE MODEL CAN BE DETERMINED, TTM CAN BE CALCULATED, DATA COLLECTION FOR VARIOUS AIRCRAFT REQUIRED CHANCES THE MODELS SIMULATION.  
DOC: ADB108357  
BIBLIOGRAPHY CITE: RAMIREZ, T.L., SHEW, R.L., FELT, J.E., RAYLE, M.E., AND JAMES, G.M., A METHOD FOR DETERMINING TASK TIME INCREASE CAUSED BY THE INDIVIDUAL PROTECTIVE ENSEMBLE, AAMRL-TR-86-036, ARMSTRONG AEROSPACE MEDICAL RESEARCH LABORATORY (AAMRL), WRIGHT-PATTERSON AFB, OH, JUNE 1986

TITLE: METHODS FOR PREDICTING JOB ABILITY REQUIREMENTS: II. ABILITY REQUIREMENTS AS A FUNCTION OF CHANGES IN THE CHARACTERISTICS OF AN ELECTRONIC FAULT FINDING TASK, AIR-R74-6  
AUTHOR: A.M. ROSE, P.W. FINGERMAN, G.R. WHEATON, E. EISNER, G. KRAMER  
ORIGINATING ORG: AMERICAN INSTITUTE FOR RESEARCH, SILVER SPRING, MD FOR PERSONNEL AND TRAINING RESEARCH PROGRAMS, OFFICE OF NAVAL RESEARCH, ARLINGTON, VA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 74/08/01  
COMMENTS: THIS REPORT DESCRIBES THE SECOND STUDY IN A PROGRAM OF RESEARCH DEALING WITH THE RELATIONSHIPS BETWEEN THE CHARACTERISTICS OF HUMAN TASKS AND THE ABILITIES REQUIRED FOR TASK PERFORMANCE. THE GOAL OF THE PROGRAM IS TO GENERATE PRINCIPLES WHICH CAN BE USED TO IDENTIFY ABILITY REQUIREMENTS FROM KNOWLEDGE OF THE CHARACTERISTICS OF A TASK AND OF VARIATIONS IN THE CONDITIONS OF TASK PERFORMANCE.  
DOC: AD785868

TITLE: COMPOUND 302,196: INTRAMUSCULAR ADMINISTRATION TO MAN,  
EATR-4634

AUTHOR: F.R. SIDELL, J.S. KETCHUM, J.E. MARKIS, K.P. KYSOR  
ORIGINATING ORG: BIOMEDICAL LABORATORY (BML), EDGEWOOD ARSENAL, MD  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 72/04/01  
COMMENTS: THIS IS A STUDY OF THE EFFECTS ON HUMAN PERFORMANCE OF  
A DRUG THAT PRODUCES DELIRIUM. THE COMPOUND IS A  
GLYCOLATE AND IS GIVEN BY INTRAMUSCULAR INJECTION.

DDC: AD520499

TITLE: AN ASSESSMENT OF RESEARCH RELEVANT TO PILOT  
TRAINING, AMRL-TR-66-196

AUTHOR: A.F. SMOKE, E.R. HALL, D.E. MEYER  
ORIGINATING ORG: BIOTECHNOLOGY INC., ARLINGTON, VA FOR AEROSPACE  
MEDICAL RESEARCH LABORATORIES (AMRL),  
WRIGHT-PATTERSON AFB, OH  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 66/11/01  
COMMENTS: THIS ARTICLE ORGANIZES RESEARCH FINDINGS FROM HUMAN  
PERFORMANCE AND TRAINING RESEARCH LITERATURE  
PERTAINING TO PILOT TRAINING, TO FIND RESEARCHABLE  
ISSUES. THE REPORT DEALS WITH STUDIES ON THE  
DEFINITION OF THE PILOT'S JOB, THE ACQUISITION OF  
FLYING SKILLS, PERFORMANCE MEASURING, SIMULATION AND  
TRANSFER OF TRAINING, AND THE MAINTENANCE OF FLYING  
ABILITIES. ALSO, THIS REPORT STUDIES THE IMPROVEMENT  
OF CURRENT TRAINING METHODS USING TECHNOLOGICAL  
ADVANCES (1966 STANDARDS).

TITLE: DEVELOPMENT OF A TAXONOMY OF HUMAN  
PERFORMANCE: VALIDATION STUDY OF ABILITY SCALES FOR  
CLASSIFYING HUMAN TASKS, AIR-726/2035-4/71-TRIO

AUTHOR: G.C. THEOLOGUS, E.A. FLEISHMAN  
ORIGINATING ORG: AMERICAN INSTITUTES FOR RESEARCH, PITTSBURG, PA FOR  
ADVANCED RESEARCH PROJECTS AGENCY, DEPT. OF DEFENSE  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 1/04/01  
COMMENTS: THE OBJECTIVE OF THIS PROJECT WAS TO DEVELOP A  
TAXONOMY WHICH WHEN MERGED WITH APPROPRIATE SETS OF  
LOGIC AND DATA, CAN BE USED TO PREDICT HUMAN  
PERFORMANCE. SEVERAL DIFFERENT TAXONOMIC SYSTEMS HAVE  
BEEN DEVELOPED. THIS PUBLICATION DESCRIBES AN EFFORT  
TO DERIVE PRELIMINARY ESTIMATES OF THE CONSTRUCT AND  
PREDICTIVE VALIDITY OF ONE OF THE APPROACHES TERMED  
THE HUMAN ABILITIES APPROACH. TASK RATING SCALES BASED  
ON THIS APPROACH WERE DEVELOPED TO PROVIDE A  
PERFORMANCE-ORIENTED TASK CLASSIFICATION SYSTEM AND  
LANGUAGE TO DESCRIBE TASKS IN TERMS OF THEIR HUMAN

ABILITY REQUIREMENTS. RATINGS BY OBSERVERS USING SUCH SCALES WERE FOUND PREDICTIVE OF ACTUAL PERFORMANCE LEVELS AS WELL AS OF EMPIRICAL ESTIMATES OF THE ABILITIES REQUIRED BY THESE TASKS.

BIBLIOGRAPHY:

DOC:

BIBLIOGRAPHY CITE:

AAMRL-TR-87-006

AD736194

THEOLOGUS, G. C., AND FLEISHMAN, E., DEVELOPMENT OF A TAXONOMY OF HUMAN PERFORMANCE: VALIDATION STUDY, AMERICAN INSTITUTE FOR RESEARCH, PITTSBURGH, PA, 1971.

TITLE:

METHODS FOR PREDICTING JOB-ABILITY REQUIREMENTS: I. ABILITY REQUIREMENTS AS FUNCTION OF CHANGES IN THE CHARACTERISTICS OF AN AUDITORY SIGNAL IDENTIFICATION TASK, AIR-31300-9/73-TR

AUTHOR:

G.R. WHEATON, E.J. SHAFFER, A. MIRABELLA, E.A.

FLEISHMAN

ORIGINATING ORG:

AMERICAN INSTITUTES FOR RESEARCH, SILVER SPRING, MD FOR OFFICE OF NAVAL RESEARCH ARLINGTON, VA

CLASSIFICATION:

UNCLASSIFIED

DOCUMENT DATE:

73/09/01

COMMENTS:

THIS REPORT DESCRIBES THE FIRST STUDY IN A PROGRAM OF RESEARCH DEALING WITH THE RELATIONSHIPS BETWEEN THE CHARACTERISTICS OF HUMAN TASKS AND ABILITIES REQUIRED FOR PERFORMANCE. SUBJECTS WERE GIVEN A BATTERY OF REFERENCE ABILITY TESTS WHICH WERE FACTOR ANALYZED. THE EXTENT TO WHICH THESE FACTORS PREDICTED PERFORMANCE ON THE CRITERION TASK, AN AUDITORY PERCEPTION TASK IN WHICH SIGNAL LENGTH AND SIGNAL-TO-NOISE RATIOS WERE VARIED, WAS STUDIED.

AAMRL-TR-85-077

FLEISHMAN, E. A., ET AL., METHODS FOR PREDICTING JOB-ABILITY REQUIREMENTS: VOL. I. ABILITY REQUIREMENTS AS A FUNCTION OF CHANGES IN THE CHARACTERISTICS OF AN AUDITORY SIGNAL IDENTIFICATION TASK, AIR-31300-9/73-TR, AMERICAN INSTITUTES FOR RESEARCH, SILVER SPRING, MD, FOR OFFICE OF NAVAL RESEARCH, ARLINGTON, VA, SEPTEMBER 1973.

TITLE:

METHODS FOR PREDICTING JOB-ABILITY REQUIREMENTS: IV. TASK CHARACTERISTICS, ABILITY REQUIREMENTS, AND PROBLEM-SOLVING STRATEGIES

AUTHOR:

G.R. WHEATON, A.M. ROSE, P.W. FINGERMAN

ORIGINATING ORG:

AMERICAN INSTITUTES FOR RESEARCH, WASHINGTON, DC FOR OFFICE OF NAVAL RESEARCH, ARLINGTON, VA

CLASSIFICATION:

UNCLASSIFIED

DOCUMENT DATE:

75/09/30

COMMENTS:

THIS REPORT DESCRIBES THE FOURTH AND FINAL STUDY IN A PROGRAM OF RESEARCH DEALING WITH THE RELATIONSHIPS BETWEEN THE CHARACTERISTICS OF HUMAN TASKS AND THE ABILITIES REQUIRED FOR TASK PERFORMANCE. THE GOAL OF

THE PROGRAM HAS BEEN TO GENERATE PRINCIPLES WHICH CAN BE USED TO IDENTIFY ABILITY REQUIREMENTS FROM KNOWLEDGE OF THE CHARACTERISTICS OF A TASK AND OF VARIATIONS IN THE CONDITIONS OF TASK PERFORMANCE. SUCH KNOWLEDGE HAS IMPORTANT IMPLICATIONS FOR BOTH SELECTION AND TRAINING OF PERSONNEL.

DDC: ADA015719

TITLE: FINAL REPORT, DEVELOPMENT TEST II (PQT-G) OF XM30 SERIES PROTECTIVE MASKS AND ACCESSORIES, DPG-FR-84-203  
AUTHOR: N.P. WOLD, J. STEELMAN  
ORIGINATING ORG: DUGWAY PROVING GROUND (DPG), DUGWAY, UT  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 84/03/01  
COMMENTS: REPORTS ON A SERIES OF TESTS PERFORMED ON THE XM30 SERIES PROTECTIVE MASKS AND ACCESSORIES TO DETERMINE IF THEY MET EVALUATION CRITERIA. TESTING INCLUDED RECEIPT INSPECTION, SAFETY, OPERATOR TRAINING, INITIAL PERFORMANCE, FILTER REPLACEMENT, ADAPTABILITY, WEAR AND CARRY, IMMERSION, SANITIZATION AND DECONTAMINATION, RESISTANCE TO BATTLEFIELD CONTAMINANTS, AND ACCELERATED ENVIRONMENTAL STORAGE. HUMAN FACTORS, SAFETY, COMPATABILITY, RELIABILITY, DURABILITY, AND MAINTAINABILITY WERE EVALUATED THROUGHOUT THE TEST. CONCLUDED THAT XM30 SERIES MASKS AND ACCESSORIES ARE NOT SUITABLE FOR FIELDING.

DDC: ADB082531  
SOURCE: DTIC

TITLE: ATTENTIONAL RESOURCE ALLOCATION IN A VARIABLE DIFFICULTY DUAL TASK PARADIGM, AFOSR-77-3380  
AUTHOR: C.D. WICKENS, B. PIERCE  
ORIGINATING ORG: UNIVERSITY OF ILLINOIS, CHAMPAIGN, IL FOR AIR FORCE  
OFFICE OF SCIENTIFIC RESEARCH (AFOSR), WASHINGTON, DC  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 77/02/01  
COMMENTS: THIS STUDY SEEKS TO DESCRIBE AND EVALUATE THE HUMAN ATTENTION ALLOCATION SYSTEM (AAS) BY USING LINEAR FEEDBACK CONTROL THEORY TO MODEL DUAL TASK PERFORMANCE IN VARIABLE DIFFICULTY CONDITIONS. EIGHT SUBJECTS PERFORMED TWO CONCURRENT TRACKING TASKS, ONE OF PRIMARY AND ONE OF SECONDARY IMPORTANCE. THE DIFFICULTY OF THE PRIMARY TASK IS VARIED IN A SEMI-PERIODIC FASHION FEEDBACK ON HOW THE SUBJECT WAS PERFORMING WAS GIVEN HALF THE TIME. SEVERAL CONCLUSIONS WERE DRAWN: THIS STUDY SUPPORTS THE THEORY THAT AN AAS CAN BE MODELED WITH LINEAR CONTROL THEORY; PRIMARY TASK PERFORMANCE WAS HIGHLY SENSITIVE TO PRIMARY TASK DIFFICULTY INDICATING THAT SUBJECTS COULD NOT OPTIMALLY ALLOCATE RESOURCES FROM THE SECONDARY TO

THE PRIMARY TASK; AND THE FEEDBACK DISPLAY SEEMED TO ACT AS A DISTRACTING THIRD TASK THAT DIVERTED RESOURCES FROM THE SECONDARY TASK.

DDC: ADA059463

SOURCE: DTIC

BIBLIOGRAPHY CITE: WICKENS, C.D. AND PIERCE, B., ATTENTIONAL RESOURCE ALLOCATION IN A VARIABLE DIFFICULTY DUAL TASK PARADIGM, AFOSR-77-3380, AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR), WASHINGTON, DC, FEBRUARY 1977

TITLE: SUSTAINED INTENSIVE AIR OPERATIONS: PHYSIOLOGICAL AND PERFORMANCE ASPECTS, AGARD-CP-338

ORIGINATING ORG: ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT (AGARD), NORTH ATLANTIC TREATY ORGANIZATION (NATO), NEUILLY-SUR-SEINE, FRANCE

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 83/11/01

COMMENTS: PRESENTATIONS OF TOPICS ON MENTAL WORKLOAD AND HUMAN FACTORS IN AIR OPERATIONS ARE GIVEN IN ENGLISH AND FRENCH. PAPERS ON NEUROPHYSICAL WORKLOAD TEST BATTERY, AIRCREW CHEMICAL PROTECTIVE ENSEMBLE AND PERFORMANCE, SLEEP LOSS EFFECTS, AND BEHAVIORAL AND SUBJECTIVE WORKLOAD METRICS FOR OPERATIONAL ENVIRONMENTS.

DDC: ADA139324

SOURCE: DTIC

TITLE: CLASSIFIED TITLE, REPORT APRE-1/73

ORIGINATING ORG: ARMY PERSONNEL RESEARCH ESTABLISHMENT, FARNBOROUGH, UK

CLASSIFICATION: CONFIDENTIAL

DOCUMENT DATE: 73/04/01

COMMENTS: THIS IS VOLUME I OF A TWO VOLUME REPORT ON EXERCISE JEREMISH, WHICH WAS A BRITISH EXERCISE TO EXAMINE PERFORMANCE CAPABILITIES IN A CHEMICAL ENVIRONMENT. RESULTS INCLUDE: TRAINING, STATE OF HEALTH, HUMAN FACTORS ASPECTS, SLEEP, FLUID CONSUMPTION, MEALS, AND RECOMMENDATIONS FOR FUTURE ACTIVITIES.

DDC: AD596480

TITLE: ISSUES CONCERNING THE PSYCHOLOGICAL IMPACT OF TACTICAL NUCLEAR WARFARE, DNA-4962T

ORIGINATING ORG: THE BDM CORPORATION, MCLEAN, VIRGINIA, FOR THE DEFENSE NUCLEAR AGENCY (DNA), WASHINGTON, DC

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 79/04/06

COMMENTS: ONE UNCERTAINTY ASSOCIATED WITH THE EFFECTIVENESS OF MILITARY OPERATIONS IN A NUCLEAR ENVIRONMENT IS THE NATURE OF THE PSYCHOLOGICAL RESPONSE OF COMBAT

PERSONNEL AND THE IMPACT OF THIS RESPONSE ON INDIVIDUAL PERFORMANCE. THE OBJECTIVE OF THIS STUDY IS TO SUMMARIZE THE CURRENT STATUS OF RESEARCH IN THIS AREA, TO IDENTIFY THE MAJOR ISSUES, AND TO RECOMMEND DIRECTION FOR FURTHER STUDY. TO SUPPORT THIS OBJECTIVE, STUDIES CONCERNING HUMAN RESPONSE UNDER STRESS AND ANALYSES OF PSYCHOLOGICAL RESPONSE TO CONVENTIONAL WARFARE WERE REVIEWED, AND INTERVIEWS WITH FIFTEEN EXPERTS IN THE AREAS OF HUMAN BEHAVIOR AND PERFORMANCE AND TACTICAL NUCLEAR WARFARE WERE CONDUCTED. RESULTING ISSUES WERE SUMMARIZED AND PRIORITIZED, KEY POINTS IDENTIFIED, AND SHORTCOMINGS DETERMINED. SPECIFIC RECOMMENDATIONS FOR CONTINUED RESEARCH ARE PRESENTED.

TITLE: THE NETHERLANDS STUDIES THE RELATIONSHIP OF CLOTHING DESIGN TO MILITARY PERFORMANCE, DST-85C-005416  
ORIGINATING ORG: DEFENSE INTELLIGENCE AGENCY, WASHINGTON, DC  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 85/03/18  
COMMENTS: RESEARCH AT THE INSTITUTE OF PERCEPTION, DIVISION OF NATIONAL DEFENSE OF TNO, SOESTERBERG PRODUCED THE FOLLOWING CONCLUSIONS REGARDING THE EFFECTS OF CLOTHING AND EQUIPMENT DESIGN ON HUMAN PERFORMANCE: 1) INDIVIDUAL PERFORMANCE ON STANDARD TESTS CANNOT BE USED TO MEASURE MILITARY UNIT PERFORMANCE, 2) LITTLE IS KNOWN ABOUT THE CUMULATIVE EFFECTS AND INTERRELATIONSHIPS OF CLOTHING AND PROTECTIVE EQUIPMENT OF DIFFERENT WEIGHTS WHEN WORN TOGETHER, 3) THE RELATIONSHIPS OF HEART RATE AND BODY TEMPERATURE TO WORK PERFORMANCE HAS BEEN DETERMINED AND CAN BE USED TO PREDICT CASUALTIES, AND 4) WEARING OF BODY ARMOR, CHEMICAL WARFARE ENSEMBLES, LOAD CARRYING SYSTEMS, AND ARCTIC CLOTHING SERIOUSLY HINDERS PERFORMANCE. NO FURTHER DETAILS ARE GIVEN.  
BIBLIOGRAPHY CITE: THE NETHERLANDS STUDIES THE RELATIONSHIP OF CLOTHING DESIGN TO MILITARY PERFORMANCE, DST-85C-005416, DEFENSE INTELLIGENCE AGENCY, WASHINGTON, DC, MARCH 1985  
  
TITLE: PROTECTIVE SCIENCES DIVISION, PROGRESS REPORT, 1 JULY 1979 TO 31 DECEMBER 1979  
ORIGINATING ORG: DEFENCE RESEARCH ESTABLISHMENT, OTTAWA, ONTARIO, CANADA  
CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 80/04/01  
COMMENTS: THIS DOCUMENT CONTAINS PROGRESS REPORTS ON TECHNICAL PROGRAMS SPONSORED BY THE PROTECTIVE SCIENCES DIVISION OF THE DEFENCE RESEARCH ESTABLISHMENT. REPORTS ON FOUR PROGRAMS ARE INCLUDED: 1) NUCLEAR DEFENSE, 2) CHEMICAL

DEFENSE, 3) ENHANCEMENT OF HUMAN PERFORMANCE, AND 4) OPERATIONAL MEDICINE. UNDER THE CHEMICAL DEFENSE PROGRAM, TWO PROJECTS ARE DISCUSSED: CHEMICAL AGENT DETECTION AND DECONTAMINATION, AND PHYSICAL PROTECTION AGAINST CHEMICAL AGENTS. FOR EACH PROJECT DISCUSSED, INDIVIDUAL REPORTS ARE GIVEN FOR THE MAJOR TASKS. INCLUDED IN THE REPORTS ARE THE TASK OBJECTIVES, OVERALL GOALS, PREVIOUS HIGHLIGHTS AND PROGRESS IN THE PERIOD. A LIMITED AMOUNT OF DATA IS INCLUDED.

DDC: ADC021896

TITLE: PROTECTIVE SCIENCES DIVISION, PROGRESS REPORT, 1 JULY 1981 TO 31 DECEMBER 1981

ORIGINATING ORG: DEFENCE RESEARCH ESTABLISHMENT, OTTAWA, ONTARIO, CANADA

CLASSIFICATION: CONFIDENTIAL

DOCUMENT DATE: 81/12/31

COMMENTS: THIS DOCUMENT CONTAINS PROGRESS REPORTS ON TECHNICAL PROGRAMS SPONSORED BY THE PROTECTIVE SCIENCES DIVISION OF THE DEFENCE RESEARCH ESTABLISHMENT. REPORTS ON FOUR PROGRAMS ARE INCLUDED: 1) NUCLEAR DEFENSE, 2) CHEMICAL DEFENSE, 3) ENHANCEMENT OF HUMAN PERFORMANCE, AND 4) OPERATIONAL MEDICINE. UNDER THE CHEMICAL DEFENSE PROGRAM, TWO PROJECTS ARE DISCUSSED: CHEMICAL AGENT DETECTION AND DECONTAMINATION, AND PHYSICAL PROTECTION AGAINST CHEMICAL AGENTS. FOR EACH PROJECT DISCUSSED, INDIVIDUAL REPORTS ARE GIVEN FOR THE MAJOR TASKS. INCLUDED IN THE REPORTS ARE THE TASK OBJECTIVES, OVERALL GOALS, PREVIOUS HIGHLIGHTS, AND PROGRESS IN THE PERIOD. A LIMITED AMOUNT OF DATA IS INCLUDED.

DDC: ADC029012

TITLE: PROTECTIVE SCIENCES DIVISION PROGRESS REPORT, 1 JANUARY TO 30 SEPTEMBER 1983

ORIGINATING ORG: DEFENCE RESEARCH ESTABLISHMENT OTTAWA, ONTARIO

CLASSIFICATION: CONFIDENTIAL

DOCUMENT DATE: 83/12/01

COMMENTS: DIVISIONAL HIGHLIGHTS FOR EACH SUBPROGRAM IN FOUR TECHNICAL PROGRAMS ARE PRESENTED. THE TECHNICAL PROGRAMS DISCUSSED ARE NUCLEAR DEFENSE, CHEMICAL DEFENSE, ENHANCEMENT OF HUMAN PERFORMANCE, AND OPERATIONAL MEDICINE. SUBPROGRAMS INCLUDED: PHYSICAL AND BIOLOGICAL EFFECTS OF NUCLEAR WEAPONS, CHEMICAL AGENT DETECTION AND DECONTAMINATION, PHYSICAL PROTECTION AGAINST CHEMICAL AGENTS, AND BIOLOGICAL EFFECTS OF ELECTROMAGNETIC RADIATION.

DDC: ADC033744

TITLE: PROTECTIVE SCIENCES DIVISION, PROGRESS REPORT 1 JANUARY 1980 TO 30 JUNE 1980

ORIGINATING ORG: DEFENCE RESEARCH ESTABLISHMENT SUFFIELD(DRES),  
CANADA  
CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 80/06/01  
COMMENTS: FAIR, CONTAINED IN THIS PROGRESS REPORT ARE  
DISCUSSIONS OF THE NUCLEAR, CHEMICAL DEFENSE,  
ENHANCEMENT OF HUMAN PERFORMANCE, AND OPERATIONAL  
MEDICINE.

DDC: ADC024036

TITLE: PROCEEDINGS OF THE 1984 ARMY SCIENCE CONFERENCE  
VOLUME II  
ORIGINATING ORG: DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND  
ACQUISITION, DEPARTMENT OF THE ARMY, WASHINGTON DC  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 84/06/22  
COMMENTS: A COLLECTION OF 26 PAPERS PRESENTED AT THE ARMY  
SCIENCE CONFERENCE OF 1984 INCLUDING THE FOLLOWING  
TOPICS - SIGNAL PROCESSING, HUMAN ANTHRAX VACCINE,  
EXPLOSIVE BEHAVIOR, CHEMICALLY-INDUCED CUTANEOUS  
IRRITATION, ORAL VACCINES AGAINST BACTERIAL DISEASES,  
RADIOCHROMIC WAVEGUIDE DOSIMETRY, PARACHUTES, TERRAIN  
NAVIGATION CONCEPTS FOR AUTONOMOUS VEHICLES,  
CORROSION OF CHEMICAL MUNITIONS, SHAPED-CHARGE  
WARHEAD PERFORMANCE, TEXTURE MEASURE OVER VECTOR  
FIELDS, TRANSCUTANEOUS OXYGEN MONITORING,  
ENDOTOXEMIA, HUMAN MODELS OF MUSTARD INDUCED  
INCAPACITATION AND INJURY, ANGIOTOXIC CHOLESTEROL  
OXIDATION PRODUCTS IN FOODS, LASERS, SPIN UP OF  
LIQUID PAYLOADS, VEHICLE RIDE CRITERIA, EFFECTS OF  
NERVE AGENTS ON MAST CELLS, SELF-PROPAGATING  
SYNTHESIS REACTION, IMPACT OF GENDER AND MILITARY  
OCCUPATIONAL SPECIALTY ON FIRST-TOUR ATTRITION, SOLID  
FUEL RAMJET AND TUBULAR PROJECTILE, NUCLEATION AND  
GROWTH DURING AMORPHOUS-CRYSTALLINE TRANSITION,  
READING ASSESSMENT IN THE ARMY.

DDC: ADA149201

TITLE: INDEPENDENT EVALUATION PLAN FOR THE DECONTAMINATION  
APPARATUS, TRUCK MOUNTED, JET EXHAUST, XM16 -  
ORIGINATING ORG: DEMONSTRATION AND VALIDATION PHASE, TRADOC ACN: 64284  
DIRECTORATE OF COMBAT DEVELOPMENTS, US ARMY CHEMICAL  
SCHOOL, FT MCCLELLAN, AL  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 82/03/01  
COMMENTS: THE INDEPENDENT EVALUATION PLAN (IEP) DEFINES 47  
ISSUES TO BE TESTED TO DETERMINE THE EFFECTIVENESS  
AND UTILITY OF THE XM16 TRUCK MOUNTED JET EXHAUST  
ECONTAMINATION APPARATUS. THE ISSUES AND CRITERIA TO  
BE EVALUATED CONCERN MISSION PERFORMANCE,

SURVIVABILITY, TRANSPORTABILITY, DEPLOYABILITY, TRAINING, LOGISTICS, HUMAN FACTORS, ETC. THE TEST WILL BE CONDUCTED IN FIVE STAGES TENTATIVELY SCHEDULED FOR SEPTEMBER, 1982 THROUGH NOVEMBER, 1983. THE XM16 IS DESIGNED TO PROVIDE LARGE SCALE RAPID DECONTAMINATION OF COMBAT VEHICLES, AIRCRAFT, AND MAJOR ITEMS OF EQUIPMENT.

DDC: ADB065375

TITLE: POSSIBLE LONG-TERM HEALTH EFFECTS OF SHORT-TERM EFFECTS OF CHEMICAL AGENTS, VOLUME III: CURRENT HEALTH STATUS OF TEST SUBJECTS

ORIGINATING ORG: NATIONAL ACADEMY OF SCIENCES, WASHINGTON, DC FOR US ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND, FREDERICK, MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 85/12/31

COMMENTS: THIS IS THE THIRD VOLUME IN A SERIES PREPARED FOR A STUDY INVESTIGATING POSSIBLE DELAYED AND LONG-TERM EFFECTS OF EXPERIMENTAL CHEMICALS ADMINISTERED TO SOLDIERS AT THE US ARMY LABORATORIES, EDGEWOOD, MARYLAND BETWEEN 1955-1975. THE TESTS WERE INTENDED TO INVESTIGATE THE IMMEDIATE AND SHORT-TERM HUMAN PERFORMANCE EFFECTS OF SHORT-TERM EXPOSURE TO VARIOUS CHEMICALS WITH WARFARE POTENTIAL AND THE SUBJECTS' RESPONSES TO THERAPY FOR SUCH EFFECTS. VOLUME III IS BASED ON INFORMATION OBTAINED FROM A QUESTIONNAIRE MAILED TO EDGEWOOD TEST SUBJECTS WHO COULD BE LOCATED, REGARDING THEIR CURRENT HEALTH STATUS. CONCLUSIONS SHOWED THAT DUE TO THE EXPERIMENTAL METHODS USED IN THE STUDY AND THE AVAILABLE COMPARISON GROUPS, THAT ONLY LARGE EFFECTS WERE LIKELY TO BE UNCOVERED. MULTIPLE TABLES REPORTING RESULTS OF THE QUESTIONNAIRE AND THE STUDY ARE INCLUDED. EXECUTIVE SUMMARIES OF VOLUMES I AND II ARE INCLUDED IN APPENDIX A.

DDC: ADA163614

SOURCE: DTIC

BIBLIOGRAPHY CITE: POSSIBLE LONG-TERM HEALTH EFFECTS OF SHORT-TERM EXPOSURE TO CHEMICAL AGENTS, VOLUME III: CURRENT HEALTH STATUS OF TEST SUBJECTS, US ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND, FREDERICK, MD, DECEMBER 1985

TITLE: MILITARY MEDICINE LITERATURE SURVEY, TDCK-G-352  
ORIGINATING ORG: TECHNISCH DOCUMENTATIE EN INFORMATIE CENTRUM, VOOR DE KRIJGSMA, THE NETHERLANDS

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 85/05/01

COMMENTS: THIS DOCUMENT CONTAINS ABSTRACTS OF MILITARY MEDICAL LITERATURE COVERING A WIDE VARIETY OF TOPICS,

INCLUDING: CHEMICAL CONTAMINATION AND DECONTAMINATION, CHEMICAL PROTECTION, CHEMICAL SIMULANTS, PHYSIOLOGICAL AND PSYCHOLOGICAL EFFECTS, ELECTRICAL SHOCK AND BURN TREATMENT, DISEASE DETECTION AND TREATMENT, TRAUMA, AND HUMAN PERFORMANCE AND BEHAVIOR. ABSTRACTS ARE IN GERMAN, FRENCH, ENGLISH, AND SWEDISH.

DDC: ADB096177

TITLE: RELIABILITY AND MAINTENANCE PROGRAM ANALYSIS, RELIABILITY AND MAINTAINABILITY ALLOCATIONS, ASSESSMENTS ANALYSIS REPORTS FOR CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM (CAMDS), FINAL REPORT, VOLUME I, DRCPM-DRD-CR-76008  
ORIGINATING ORG: TRW, REDONDO BEACH, CA FOR OFFICE OF THE PROJECT MANAGER FOR CHEMICAL DEMILITARIZATION AND INSTALLATION RESTORATION, ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 76/04/23  
COMMENTS: ANALYSIS OF THE ABILITY OF THE CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM (CAMDS) TO MEET DESIGN SPECIFICATIONS FOR DESTRUCTION OF AGENT. NO CHEMICAL WARFARE (CW) DATA ARE PROVIDED, HOWEVER SOME HUMAN PERFORMANCE DATA FOR INDIVIDUALS WORKING IN PRESSURIZED SUITS ARE PRESENTED FOR TACTILITY, DEXTERITY, AND DON-DOFT TESTS. RESULTS OF THE PHASE I ANALYSIS INDICATE THAT THE TARGET REDUCTION/DEMILITARIZATION FOR MOST MUNITION/AGENT CONFIGURATIONS WILL NOT BE MET. THE EXCEPTIONS ARE THE BULK ITEMS (BOMBS, SPRAY TANK AND TON CONTAINERS), THE 8-INCH PROJECTILE, AND THE M23 MINE.

DDC: ADA062678  
SOURCE: DTIC  
BIBLIOGRAPHY CITE: RELIABILITY AND MAINTENANCE PROGRAM ANALYSIS, RELIABILITY AND MAINTAINABILITY ALLOCATIONS, ASSESSMENTS ANALYSIS REPORTS FOR CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM (CAMDS), FINAL REPORT, VOLUME I, DRCPM-DRD-CR-76008, OFFICE OF THE PROJECT MANAGER FOR CHEMICAL DEMILITARIZATION AND INSTALLATION RESTORATION, ABERDEEN PROVING GROUND, MD, APRIL 1976

TITLE: US ARMY TEST AND EVALUATION COMMAND, TEST OPERATIONS PROCEDURE, COLD REGIONS ENVIRONMENTAL TEST OF NUCLEAR, BIOLOGICAL, AND CHEMICAL EQUIPMENT (ALARMS AND DETECTORS), TOP-8-4-005  
ORIGINATING ORG: US ARMY COLD REGIONS TEST CENTER, SEATTLE, WA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 86/01/01  
COMMENTS: REPORT CONTAINS TEST OPERATIONS PROCEDURE (TOP) FOR THE EVALUATION OF THE PERFORMANCE OF NUCLEAR,

BIOLOGICAL AND CHEMICAL (NBC) ALARMS AND DETECTION EQUIPMENT WHEN USED IN THE NATURAL COLD REGIONS ENVIRONMENT. CONTAINS PROCEDURES FOR EVALUATING STORAGE, TRANSPORTATION, ENVIRONMENTAL PERFORMANCE (NO LIMITS SET), LOGISTIC SUPPORTABILITY, RELIABILITY, HUMAN FACTORS AND SAFETY.

DDC:

SOURCE:

BIBLIOGRAPHY CITE:

ADA163640

DTIC

US ARMY TEST AND EVALUATION COMMAND, TEST OPERATIONS PROCEDURE, COLD REGIONS ENVIRONMENTAL TEST OF NUCLEAR, BIOLOGICAL, AND CHEMICAL EQUIPMENT (ALARMS AND DETECTORS), TOP-8-4-005, US ARMY COLD REGIONS TEST CENTER, SEATTLE, WA, JANUARY 1986

TITLE:

AUTOMATIC LIQUID AGENT DETECTOR OPERATIONAL TEST I (ALAD OT I), CDEC-TR-83-006

ORIGINATING ORG:

US ARMY COMBAT DEVELOPMENTS EXPERIMENTATION COMMAND, FORT ORD, CA FOR US ARMY TRAINING AND DOCTRINE

CLASSIFICATION:

COMMAND, FORT MONROE, VA

DOCUMENT DATE:

UNCLASSIFIED/LIMITED

COMMENTS:

83/04/01  
THIS REPORT PROVIDES DATA ON THE OPERATIONAL EFFECTIVENESS OF THE XM85/XM86 ALAD SYSTEM. IT EXAMINES: 1) PROPOSED TRAINING CONCEPTS, 2) FUNCTIONAL PERFORMANCE, 3) HUMAN FACTORS ASPECTS OF THE SYSTEM, AND 4) THE RELIABILITY, AVAILABILITY, AND MAINTAINABILITY (RAM) CHARACTERISTICS OF THE ALAD SYSTEM. THE TRAINING CONCEPTS ARE SHOWN TO BE ADEQUATE AND PERSONNEL CAN OPERATE THE SYSTEM IN MOPP IV. THE RELIABILITY OF THE SYSTEM WAS MUCH LESS THAN SPECIFIED: MEAN TIME BETWEEN FAILURES (MTBF) WAS 2.38 HOURS VERSUS 1000 HOURS SPECIFIED AND MEAN TIME BETWEEN FALSE ALARMS WAS 6.9 HOURS VERSUS 900 HOURS SPECIFIED. THIS REPORT PROVIDES A GOOD OVERVIEW OF THE ALAD SYSTEM.

DDC:

ADB073668

TITLE:

AVIATION PERFORMANCE ASSESSMENT IN A CHEMICAL ENVIRONMENT (APACHE) TEST DESIGN PLAN, TRACO DOC TRMS NO: 82 FC 113

ORIGINATING ORG:

U.S. ARMY COMBAT DEVELOPMENTS EXPERIMENTATION

COMMAND, FORT ORD, CA

CLASSIFICATION:

UNCLASSIFIED/LIMITED

DOCUMENT DATE:

82/07/23

COMMENTS:

THE PURPOSE OF THIS REPORT IS TO PROVIDE DATA TO ASSESS THE DEGREE OF DEGRADATION, IF ANY, IN ATTACK HELICOPTER TEAM PERFORMANCE ATTRIBUTED TO CONDUCTING EXTENDED COMBAT OPERATIONS WHILE WEARING THE CHEMICAL/BIOLOGICAL (CB) PROTECTIVE ENSEMBLE. THE RESULTS OF THIS FORCE DEVELOPMENT TEST AND

EXPERIMENTATION (FDTE) WILL BE USED BY THE ARMY AVIATION CENTER (USAACVNC), ARMY CHEMICAL SCHOOL (USACS), ARMY HUMAN ENGINEERING LABORATORY (USAHEL), AND ARMY MATERIEL SYSTEMS ANALYSIS AGENCY (USAMSA) TO SUPPORT ASSESSMENT OF AVIATION CHEMICAL OPERATIONS, ASSIST IN DEVELOPMENT OF DOCTRINE, AND IN MAKING FORCE DEVELOPMENT RECOMMENDATIONS.

AAMRL-TR-86-054, AAMRL-TR-86-055

ADB068081

AVIATION PERFORMANCE ASSESSMENT IN A CHEMICAL ENVIRONMENT, TEST DESIGN PLAN, ARMY COMBAT DEVELOPMENT EXPERIMENTATION COMMAND, FORT ORD, CA, JULY 1982

BIBLIOGRAPHY:

DDC:

BIBLIOGRAPHY CITE:

TITLE:

BATTLE DRESS OVERGARMENT WEAR TEST - PHASE II (BDO II), CDEC-TR-82-003

ORIGINATING ORG: US ARMY COMBAT DEVELOPMENTS EXPERIMENTATION COMMAND, FORT ORD, CA

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 82/06/01

COMMENTS: THIS DOCUMENT IS A LETTER REPORT OF A BATTLE DRESS OVERGARMENT (BDO) WEAR TEST. A TOTAL OF 108 BDO'S AND 22 CHEMICAL PROTECTIVE OVERGARMENTS (CP'S) WERE WORN BY 108 SOLDIERS FOR PERIODS RANGING FROM ONE TO SIX DAYS. THIS DOCUMENT DESCRIBES THE BACKGROUND AND CONDUCT OF THE VARIOUS TESTS AND PRESENTS FIELD TESTERS OBSERVATIONS, WEARER ANTHROPOMETRIC AND DEMOGRAPHIC DATA, WORK PERFORMANCE CAPABILITY FOR EACH OVERGARMENT, METEOROLOGICAL FACTORS ENCOUNTERED DURING THE TESTING, AND HUMAN FACTORS DATA CONCERNING VARIOUS ASPECTS OF ENSEMBLE WEARABILITY.

AAMRL-TR-85-077

ADB065726

BIBLIOGRAPHY: BATTLE DRESS OVERGARMENT WEAR TEST, PHASE II, CDEC-TR-82-003, ARMY COMBAT DEVELOPMENT EXPERIMENTATION COMMAND, FORT ORD, CA, JUNE 1982.

BIBLIOGRAPHY:

DDC:

BIBLIOGRAPHY CITE:

TITLE:

US ARMY TEST AND EVALUATION COMMAND TEST OPERATIONS PROCEDURE MASKS, PROTECTIVE, TOP-8-2-110

ORIGINATING ORG: US ARMY DUGWAY PROVING GROUND (DPG), DUGWAY, UT

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 80/10/01

COMMENTS: THIS TEST OPERATIONS PROCEDURE (TOP) COVERS GENERAL PROCEDURES FOR DETERMINING THE TECHNICAL PERFORMANCE AND SAFETY ASPECTS OF PROTECTIVE MASKS RELATIVE TO SPECIFIC CRITERIA. A FEW OF THE CHARACTERISTICS WHICH ARE TO BE ADDRESSED IN THE TESTS TO BE CONDUCTED INCLUDE PROTECTIVE CAPACITY, HUMAN FACTOR CHARACTERISTICS, FIT, RELIABILITY, OPTICAL PROPERTIES, AND MATERIAL PERFORMANCE.

DDC: ADA091737

TITLE: OPERATIONAL TEST II OF XM40 CB PROTECTIVE MASK AND US-10 RESPIRATOR, USAIB-P-3761

ORIGINATING ORG: US ARMY INFANTRY BOARD, FORT BENNING, GA

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 85/10/01

COMMENTS: THIS REPORT DESCRIBES THE TESTS AND RESULTS FROM THOSE TESTS PERFORMED ON THE XM40 CB PROTECTIVE MASK AND US-10 RESPIRATOR. THE TESTS WERE DESIGNED TO ADDRESS THE FOLLOWING ISSUES: MISSION PERFORMANCE; RAM (RELIABILITY, AVAILABILITY, AND MAINTAINABILITY); LOGISTICS; TRAINING; COMPATIBILITY; HUMAN FACTORS; AND SAFETY. TESTS WERE CONDUCTED DURING ACTUAL MISSION SCENARIOS WITH THE SOLDIERS WEARING THE MASKS WHILE PERFORMING TASKS. MAJOR FINDINGS INCLUDE: MISSION PERFORMANCE IS BETTER WITH THIS MASK THAN PREVIOUS MASKS; SEVERE VISION DEGRADATION IS INVOLVED IN AIRBORNE MISSIONS; AND MASK-TO-FACE SEAK ON THE MASK DO BREAK, BUT WITH PROPER TRAINING MOST OF THIS CAN BE AVOIDED.

DDC: ADB097906

BIBLIOGRAPHY CITE: OPERATIONAL TEST II OF XM40 CB PROTECTIVE MASK AND US-10 RESPIRATOR, USAIB-P-3761, US ARMY INFANTRY BOARD, FORT BENNING, GA, OCTOBER 1985

TITLE: US ARMY TEST AND EVALUATION COMMAND COMMODITY ENGINEERING TEST PROCEDURE "ALARMS, BIOLOGICAL", MTP-8-2-066

ORIGINATING ORG: US ARMY TEST AND EVALUATION COMMAND (USATECOM), ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 68/01/31

COMMENTS: THIS MATERIEL TEST PROCEDURE (MTP) OUTLINES THE GENERAL TEST PROCEDURES USED TO DETERMINE WHETHER THE TECHNICAL PERFORMANCE AND SAFETY ASPECTS OF BIOLOGICAL ALARMS MEET THE CRITERIA ESTABLISHED BY VARIOUS MATERIEL DOCUMENTATION. SOME OF THE TESTING ELEMENTS INCLUDE: ROUGH HANDLING, AIR DROP COMPATIBILITY, DECONTAMINATION AND MAINTENANCE ASPECTS, SENSITIVITY AND RESPONSE, ELECTROMAGNETIC RADIATION VULNERABILITY, NUCLEAR EFFECTS, AND HUMAN FACTORS. DOCUMENT LISTS REQUIRED TESTS AND PROVIDES REFERENCES TO THE APPROPRIATE TECHNICAL PUBLICATIONS WHICH DETAIL THE TEST PROCEDURES.

DDC: AD719125

SOURCE: DTIC

BIBLIOGRAPHY CITE: US ARMY TEST AND EVALUATION COMMAND COMMODITY ENGINEERING TEST PROCEDURE "ALARMS, BIOLOGICAL,"

-2-066, US ARMY TEST AND EVALUATION COMMAND  
(USATECOM), ABERDEEN PROVING GROUND, MD, JANUARY 1968

TITLE: US ARMY TEST AND EVALUATION COMMAND COMMODITY  
ENGINEERING TEST PROCEDURE "DECONTAMINATING APPARATUS,  
PORTABLE", MTP-8-2-061

ORIGINATING ORG: US ARMY TEST AND EVALUATION COMMAND (USATECOM),  
ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 67/09/30

COMMENTS: THIS MATERIEL TEST PROCEDURE (MTP) OUTLINES THE  
GENERAL TEST PROCEDURES USED TO DETERMINE WHETHER THE  
TECHNICAL PERFORMANCE AND SAFETY ASPECTS OF A PORTABLE  
DECONTAMINATING APPARATUS MEET THE CRITERIA  
ESTABLISHED BY VARIOUS MATERIEL DOCUMENTATION. SOME OF  
THE TESTING ELEMENTS INCLUDE: ROUGH HANDLING, AIR DROP  
CAPABILITY, OPERATIONAL RELIABILITY, HUMAN FACTORS,  
AND MAINTENANCE. DOCUMENT LISTS THE REQUIRED TESTS AND  
PROVIDES REFERENCES TO THE APPROPRIATE TECHNICAL  
PUBLICATIONS WHICH DETAIL THE TEST PROCEDURES.

SOURCE: DTIC

BIBLIOGRAPHY CITE: US ARMY TEST AND EVALUATION COMMAND COMMODITY  
ENGINEERING TEST PROCEDURE "DECONTAMINATING APPARATUS,  
PORTABLE", RP-8-2-061, US ARMY TEST AND EVALUATION  
COMMAND (USATECOM), ABERDEEN PROVING GROUND, MD,  
SEPTEMBER 1967

TITLE: US ARMY TEST AND EVALUATION COMMAND COMMODITY  
ENGINEERING TEST PROCEDURE "DECONTAMINATING  
APPARATUSSES, POWER DRIVEN, VEHICULAR OR SKID  
MOUNTED", MTP-8-2-062

ORIGINATING ORG: US ARMY TEST AND EVALUATION COMMAND (USATECOM),  
ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 69/10/06

COMMENTS: THE OBJECTIVE OF THIS MATERIEL TEST PROCEDURE (MTP)  
WAS TO EVALUATE TECHNICAL PERFORMANCE AND SAFETY  
ASPECTS OF DECONTAMINATING APPARATUSSES (POWER-DRIVEN,  
VEHICULAR OR SKID-MOUNTED) BY PERFORMING THE FOLLOWING  
TESTS: VISUAL INSPECTION, ENVIRONMENTAL SURVIVABILITY,  
PORTABILITY, ABILITY TO DECONTAMINATE,  
MAINTAINABILITY, RELIABILITY, AGENT-HARDWARE  
COMPATIBILITY, AUXILIARY CAPABILITY, DURABILITY AND  
HUMAN FACTORS ASPECTS. DOCUMENT LISTS REQUIRED TESTS  
AND PROVIDES REFERENCES TO THE APPROPRIATE TECHNICAL  
MANUALS WHICH DETAIL TEST PROCEDURES.

DDC: AD720978

SOURCE: DTIC

BIBLIOGRAPHY CITE: US ARMY TEST AND EVALUATION COMMAND COMMODITY  
ENGINEERING TEST PROCEDURE "DECONTAMINATING

APPARATUSES, POWER DRIVEN, VEHICULAR OR SKID MOUNTED", MTP-8-2-062, US ARMY TEST AND EVALUATION COMMAND (USATECOM), ABERDEEN PROVING GROUND, MD, OCTOBER 1969

TITLE: US ARMY TEST AND EVALUATION COMMAND ENVIRONMENTAL TEST PROCEDURE "ARCTIC ENVIRONMENTAL TEST OF CB PROTECTIVE CLOTHING, PROTECTIVE MASKS AND WINTERIZATION KITS", UTP-8-4-006

ORIGINATING ORG: US ARMY TEST AND EVALUATION COMMAND (USATECOM), ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 70/01/01

COMMENTS: THIS 1970 ENVIRONMENTAL TEST PROCEDURE OUTLINES TEST AND TECHNIQUES DESIGNED TO DETERMINE AND EVALUATE THE PERFORMANCE CHARACTERISTICS OF CHEMICAL BIOLOGICAL PROTECTIVE CLOTHING, PROTECTIVE MASKS AND WINTERIZATION KITS IN ARCTIC-ENVIRONMENTAL CONDITIONS. SPECIFIC SUBTESTS TO BE PERFORMED INCLUDE: OPERATIONAL RELIABILITY, CHEMICAL CHALLENGER IN THE ARCTIC ENVIRONMENT, HUMAN FACTORS ENGINEERING AND SAFETY AND MAINTENANCE EVALUATION. NO DATA WERE PROVIDED.

DOC: AD719131

BIBLIOGRAPHY CITE US ARMY TEST AND EVALUATION COMMAND ENVIRONMENTAL TEST PROCEDURE "ARCTIC ENVIRONMENTAL TEST OF CB PROTECTIVE CLOTHING, PROTECTIVE MASKS AND WINTERIZATION KITS", MTP-8-4-006, US ARMY TEST AND EVALUATION COMMAND (USATECOM), ABERDEEN PROVING GROUND, MD, JANUARY 1970

TITLE: US ARMY TEST AND EVALUATION COMMAND ENVIRONMENTAL TEST PROCEDURE "ARCTIC ENVIRONMENTAL TEST OF CHEMICAL AGENT DELIVERY DEVICES", MTP-8-4-008

ORIGINATING ORG: US ARMY TEST AND EVALUATION COMMAND, ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 71/11/01

COMMENTS: THIS MATERIEL TEST PROCEDURE (MTP) PROVIDES A METHOD FOR EVALUATION OF CHEMICAL AGENT DELIVERY DEVICE PERFORMANCE CHARACTERISTICS. IT DESCRIBES PRETEST REQUIREMENTS FOR INITIAL INSPECTION, PHYSICAL CHARACTERISTICS, PERSONNEL TRAINING, INSTRUMENTATION, FACILITIES, AND EQUIPMENT. THE OBJECTIVE OF THE PROCEDURES OUTLINED IN THIS MTP IS TO EVALUATE THE PERFORMANCE, SAFETY, AND HUMAN FACTORS ENGINEERING, AND MAINTENANCE CHARACTERISTICS OF CHEMICAL AGENT

DELIVERY DEVICES UNDER ARCTIC WINTER ENVIRONMENTAL CONDITIONS.

DDC:

SOURCE:

BIBLIOGRAPHY CITE:

AD734847

DTIC

US ARMY TEST AND EVALUATION COMMAND ENVIRONMENTAL TEST PROCEDURE "ARCTIC ENVIRONMENTAL TEST OF CHEMICAL AGENT DELIVERY DEVICES," MTP-8-4-008, US ARMY TEST AND EVALUATION COMMAND, ABERDEEN PROVING GROUND, MD, NOVEMBER 1971

TITLE:

US ARMY TEST AND EVALUATION COMMAND MATERIEL TEST PROCEDURE 8-2-072, COMMODITY ENGINEERING TEST PROCEDURE, - "SAMPLING AND ANALYZING KITS, CBR AGENT", MTP-8-2-072

ORIGINATING ORG:

US ARMY TEST AND EVALUATION COMMAND (USATECOM), ABERDEEN PROVING GROUND, MD

CLASSIFICATION:

UNCLASSIFIED/LIMITED

DOCUMENT DATE:

70/03/03

COMMENTS:

THIS DOCUMENT OUTLINES GENERAL PROCEDURES FOR EVALUATING THE PERFORMANCE, SAFETY AND HUMAN FACTORS ENGINEERING CHARACTERISTICS OF CHEMICAL, BIOLOGICAL AND RADIOLOGICAL (CBR) SAMPLING AND ANALYZING KITS. TOPICS INCLUDE: RECEIPT INSPECTION, SAFETY EVALUATION, SIMULATED ENVIRONMENTAL TESTING, ROUGH HANDLING AND SURFACE TRANSPORT, AIR TRANSPORT, AIR DROP CAPABILITY, DECONTAMINATION ASPECTS, OPERATIONAL CHARACTERISTICS, FIELD OPERABILITY AND HUMAN FACTORS

DDC:

AD868299

SOURCE:

DTIC

BIBLIOGRAPHY CITE:

US ARMY TEST AND EVALUATION COMMAND MATERIEL TEST PROCEDURE 8-2-072, COMMODITY ENGINEERING TEST PROCEDURE, - "SAMPLING AND ANALYZING KITS, CBR AGENT", MTP-8-2-072, US ARMY TEST AND EVALUATION COMMAND (USATECOM), ABERDEEN PROVING GROUND, MD, MARCH 1970

TITLE:

US ARMY TEST AND EVALUATION COMMAND MATERIEL TEST PROCEDURE 8-4-003 COMMON TROPICAL ENVIRONMENTAL TEST PROCEDURE - "CHEMICAL EQUIPMENT", MTP-8-4-003

ORIGINATING ORG:

US ARMY TEST AND EVALUATION COMMAND, ABERDEEN PROVING GROUND, MD

CLASSIFICATION:

UNCLASSIFIED/LIMITED

DOCUMENT DATE:

70/10/01

COMMENTS:

THIS DOCUMENT PROVIDES TEST METHODOLOGY AND TESTING TECHNIQUES FOR DETERMINING THE CAPABILITY OF CHEMICAL MUNITIONS, WEAPONS AND EQUIPMENT TO WITHSTAND EXPOSURE TO, AND FUNCTION EFFECTIVELY WITHIN, HUMID, TROPIC ENVIRONMENTS. TEST DESCRIPTION COVERS INITIAL

DDC:  
SOURCE:  
BIBLIOGRAPHY CITE: EVALUATION OF EQUIPMENT, OPERATIONAL PERFORMANCE,  
STORAGE ASPECTS, SURVEILLANCE, MAINTENANCE SAFETY,  
HUMAN FACTORS AND VALUE ANALYSIS.  
AD878321  
DTIC  
US ARMY TEST AND EVALUATION COMMAND MATERIEL TEST  
PROCEDURE 8-4-003 COMMON TROPICAL ENVIRONMENTAL TEST  
PROCEDURE, - "CHEMICAL EQUIPMENT", MTP-8-4-003, US  
ARMY TEST AND EVALUATION COMMAND, ABERDEEN PROVING  
GROUND, MD, OCTOBER 1970

TITLE: US ARMY TEST AND EVALUATION COMMAND MATERIEL TEST  
PROCEDURE 8-4-012, ENVIRONMENTAL TEST PROCEDURE -  
"ARCTIC ENVIRONMENTAL TEST OF CHEMICAL AGENT DETECTOR  
KITS", MTP-8-4-012  
ORIGINATING ORG: US ARMY TEST AND EVALUATION COMMAND (USATECOM),  
ABERDEEN PROVING GROUND, MD  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 69/11/26  
COMMENTS: THIS DOCUMENT OUTLINES GENERAL PROCEDURES FOR  
EVALUATING THE PERFORMANCE, SAFETY AND HUMAN FACTORS  
ENGINEERING CHARACTERISTICS OF CHEMICAL AGENT  
DETECTION KITS UNDER ARTIC WINTER CONDITIONS. TOPICS  
OUTLINED ARE: PRE-OPERATIONAL INSPECTION AND PHYSICAL  
CHARACTERISTICS, HUMAN FACTORS ENGINEERING AND SAFETY,  
ROUGH HANDLING AND SURFACE TRANSPORT, FIELD DETECTION  
AND OPERATIONAL CHARACTERISTICS, AND AINTENANCE  
EVALUATION.

DDC:  
SOURCE:  
BIBLIOGRAPHY CITE: AD867073  
DTIC  
US ARMY TEST AND EVALUATION COMMAND MATERIEL TEST  
PROCEDURE 8-4-012, ENVIRONMENTAL TEST PROCEDURE -  
"ARCTIC ENVIRONMENTAL TEST OF CHEMICAL AGENT DETECTOR  
KITS", MTP-8-4-012, US ARMY TEST AND EVALUATION  
COMMAND (USATECOM), ABERDEEN PROVING GROUND, MD,  
NOVEMBER 1969

**APPENDIX B**  
**MODELLING ABSTRACTS**

TITLE: COMPARISON OF CHEMICAL WARFARE HAZARD IN TEMPERATE AND DESERT ENVIRONMENTS, NATICK/TR-85/062L

AUTHOR: K. BAGGE, J.A. MANICKAS, D. MALABARBA

ORIGINATING ORG: US ARMY NATICK RESEARCH AND DEVELOPMENT CENTER, NATICK, MA

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 85/08/01

COMMENTS: TO DETERMINE WHETHER DIFFERENT CP ENSEMBLES ARE NEEDED FOR USE IN DIFFERENT CLIMATES; A COMPUTER SIMULATION MODEL (NUSSE II) WAS USED TO PREDICT THE CHEMICAL HAZARD IN BOTH TEMPERATE AND DESERT CLIMATES. INITIAL LIQUID CONTAMINATION DENSITY WAS SIMILAR IN BOTH ENVIRONMENTS, BUT EVAPORATION OCCURRED MORE QUICKLY IN THE DESERT THAN IN THE TEMPERATE ENVIRONMENT. WHILE THESE RESULTS DO NOT INDICATE A NEED FOR SEPARATE CP GARMENTS, FURTHER RESEARCH TO DETERMINE THE EFFECTS OF OTHER FACTORS, SUCH AS PRECIPITATION AND CAMOUFLAGE IS NEEDED.

DDC: ADB095881

TITLE: DEGRADED EFFECTIVENESS STUDIES FOR MAJOR DEVELOPMENTAL SYSTEMS AND HIGH-DENSITY ITEMS, BRL-TR-2680

AUTHOR: J.J. BALDAUF, C.H. WICK

ORIGINATING ORG: US ARMY BALLISTIC RESEARCH LABORATORY, ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 85/09/01

COMMENTS: THE PURPOSE OF THIS STUDY WAS TO BETTER UNDERSTAND THE DEGRADED EFFECTIVENESS CAUSED BY SOLDIERS WEARING CHEMICAL PROTECTIVE CLOTHING AT THE MOST PROTECTIVE LEVEL, MISSION ORIENTED PROTECTIVE POSTURE (MOPP) LEVEL IV. DEGRADED EFFECTIVENESS FACTORS WERE OBTAINED FOR 45 DIFFERENT TASKS BY USING THE BRL CHEMICAL PROTECTION DEGRADATION MODEL. RESULTS FROM THE MODEL WERE GIVEN AND SEVERAL MODIFICATIONS SUGGESTED FOR THE MOPP ENSEMBLE.

DDC: ADA160475

SOURCE: DTIC

BIBLIOGRAPHY CITE: J.J. BALDAUF, C.H. WICK; DEGRADED EFFECTIVENESS STUDIES FOR MAJOR DEVELOPMENTAL SYSTEMS AND HIGH-DENSITY ITEMS, BRL-TR-2680; US ARMY BALLISTIC RESEARCH LABORATORY, ABERDEEN PROVING GROUND, MD; SEPTEMBER 1985.

TITLE: CONCEPTS OF MODELLING FOR LONG-RANGE AIR ARMAMENT PLANNING AND THEIR IMPLEMENTATION IN THE "TACTICAL AIR WAR ANALYSIS GAME"

AUTHOR: O.H. BAPISTELLA

ORIGINATING ORG: NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 81/09/01  
COMMENTS: "TACTICAL AIR WAR ANALYSIS GAME" (TAWAG) IS REVIEWED.  
CONCEPTUAL BACKGROUND OF THE MODEL STRUCTURE IS  
STUDIED WITH IMPROVEMENTS SUGGESTED. DIFFERENT LEVELS  
OF DOCUMENTATION WERE ALSO SUGGESTED TO MAKE MODELS  
MORE TRANSFERABLE.

DDC: ADA109575

TITLE: A PROCEDURE FOR COMPUTING EXPECTATION AND VARIABILITY  
OF CASUALTIES ACHIEVABLE BY AN ATTACK WITH AIRBORNE  
AGENTS, SU67UR3  
AUTHOR: R.S. BERKOWITZ  
ORIGINATING ORG: UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA, PA FOR US  
ARMY MUNITIONS COMMAND, EDGEWOOD ARSENAL, MD  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 67/06/01  
COMMENTS: THIS REPORT APPLIES A PROCEDURE FOR THE COMPUTATION OF  
THE EXPECTED NUMBER AND VARIABILITY (VARIANCE) OF  
CASUALTIES PREDICTED FROM A CB ATTACK. THE BASIC  
PROCEDURE IS DEMONSTRATED FOR A SINGLE AREA AND FOR  
TWO CONTIGUOUS ZONES OF UNIFORM DOSAGE. FINALLY, A  
GENERAL COMPUTER PROGRAM, WRITTEN IN (OLD) FORTRAN, IS  
PRESENTED. THE MODEL DESCRIBED IS DECIDEDLY FIRST  
ORDER, AND IS WELL PRESENTED.

TITLE: A MODEL TO PREDICT THE THREAT OF EXPOSURE TO CHEMICAL  
WARFARE AGENT IN THE INDOOR ENVIRONMENT,  
ARCSL-TR-82093  
AUTHOR: A. BIRENZVIGE  
ORIGINATING ORG: CHEMICAL SYSTEMS LABORATORIES (CSL), ABERDEEN PROVING  
GROUND, MD  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 82/03/01  
COMMENTS: A MODEL TO CALCULATE THE INDOOR CONCENTRATION OF A  
CHEMICAL CONTAMINANT WHEN THE OUTDOORS HAVE BEEN  
CONTAMINATED. FACTORS CONSIDERED INCLUDE MATERIAL  
INFILTRATION, FORCED VENTILATION, ABSORPTION, AND  
REEVAPORATION OF THE CONTAMINANT FROM INDOOR SURFACES.  
IT WAS SHOWN THAT INDOOR DOSAGE CAN BE REDUCED BY  
INCREASING THE VENTILATION RATE AFTER THE PASSAGE OF  
THE CHEMICAL CLOUD.

DDC: ADB072869  
SOURCE: DTIC

TITLE: ON THE PROTECTION FROM EXPOSURE TO CHEMICAL WARFARE  
AGENTS PROVIDED BY A BUILDING, CRDEC-TR-86026  
AUTHOR: A. BIRENZVIGE  
ORIGINATING ORG: CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER  
(CRDEC), ABERDEEN PROVING GROUND, MD

CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 86/04/01  
COMMENTS: THIS DOCUMENT DISCUSSES A THEORETICAL MODEL  
(EQUATIONS) THAT ESTIMATES EXPOSURE TO CHEMICAL AGENTS  
INSIDE A BUILDING. DATA, RESULTS, AND CONCLUSION ARE  
ALL CLASSIFIED. EXCELLENT REFERENCE MATERIAL.

DDC: ADC039521

TITLE: CHEMICAL WARFARE SHIP PENETRATION MODEL DESIGN REPORT,  
DPG-C-TA-85-03  
AUTHOR: H.R. BLACKSTEN  
ORIGINATING ORG: MCLEAN RESEARCH CENTER INCORPORATED, MCLEAN, VA FOR  
DUGWAY PROVING GROUND (DPG), DUGWAY, UT  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 85/04/01  
COMMENTS: PART OF AN EFFECTIVENESS OF MISSILES AGAINST SHIPS  
STUDY. PRESENTS A GENERAL DESIGN DESCRIPTION OF A SHIP  
CHEMICAL AGENT PENETRATION MODEL. MODEL USES  
ROOM VOLUME AND FLOW RATES TO PREDICT INTERNAL  
CONCENTRATIONS. NO DATA OR SAMPLE OUTPUT IS GIVEN.  
DDC: ADB092084

TITLE: SORTIE GENERATION AND CW ATTACK, ASD/XR-TR-76-11  
AUTHOR: L.E. BOYD  
ORIGINATING ORG: ASD/XROL, WRIGHT-PATTERSON AFB, OH  
CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 76/04/00  
COMMENTS: THIS DOCUMENT PRESENTS THE RESULTS OF A LIMITED STUDY  
OF THE EFFECT OF CW ON SORTIE GENERATION CAPABILITY.  
THE METHODOLOGY USED IS PRESENTED IN GOOD DETAIL. THE  
TECHNIQUES USED MEASURE THE IMPACT OF A CW ATTACK  
USING FOUR VARIABLES: PERSONNEL SURVIVING, WORK  
EFFICIENCY, DELAYED OPERATIONS, AND PARTIAL  
OPERATIONS. THE MODEL PRESENTED MAY PROVIDE A METHOD  
FOR DETERMINING SORT CAPABILITY IN A GROSS MANNER.

TITLE: USE OF A WETTED COVER TO REDUCE HEAT STRESS IN  
IMPERMEABLE CLOTHING, T-7/80  
AUTHOR: J.R. BRECKENRIDGE  
ORIGINATING ORG: US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE  
(ARIEM), NATICK, MA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 80/10/01  
COMMENTS: A MATHEMATICAL MODEL BASED ON PHYSICAL RELATIONS  
BETWEEN CLOTHED MAN AND HIS ENVIRONMENT IS PRESENTED.  
IT DESCRIBES THE COOLING EFFECT OF A WET COVER WORN  
OVER AN IMPERMEABLE ENSEMBLE, IN TERMS OF THE ENSEMBLE  
CHARACTERISTICS AND THE AMBIENT ENVIRONMENT. MODEL  
VALIDATION DATA AT LOW AIR MOVEMENT IS GIVEN.

DDC: ADA094322

TITLE: FORECAST CASUALTY-LOSS METHODOLOGY STUDY REPORT  
AUTHOR: J. BRINGHAM, A. BAKER, R. SPENCE, M. MALONEY, B. HOLZ  
ORIGINATING ORG: FORECAST PROJECT OFFICE, DEPARTMENT OF THE ARMY,  
PENTAGON  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 81/10/20  
COMMENTS: THIS DOCUMENT DESCRIBES THE FORECAST SYSTEM OF ARMY  
CASUALTY ESTIMATION MODELS. THESE MODELS ENCOMPASS  
ESTIMATION OF COMBAT ZONE, COMMUNICATION ZONE,  
ADMINISTRATIVE, AND LOGISTICS CASUALTIES, PERSONNEL  
MOVEMENTS, AND PATIENT FLOW RATES IN A THEATER-WIDE  
SCENARIO FOR A WAR UP TO SIX MONTHS LONG. AS THE  
BASIC MODEL USES RELATIVELY COURSE CASUALTY ESTIMATION  
DATA, PERSONNEL DENSITIES AND VULNERABILITY DATA, THE  
METHODOLOGY IS OF MARGINAL UTILITY IN AIRBASE CASUALTY  
ESTIMATION.

DDC: AD8061510

TITLE: DEVELOPMENT OF AN INACTIVE PROGRAM TO FACILITATE DATA  
INPUT FOR THE RUNNING OF THE COMPUTER PROGRAM TOTAM,  
DRES-SM-1132  
AUTHOR: P. CHUN, S.B. MELSEN  
ORIGINATING ORG: DEFENCE RESEARCH ESTABLISHMENT SUFFIELD,  
ALBERTA, CANADA  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 85/08/01  
COMMENTS: THE TOTAL THREAT ASSESSMENT MODEL (TOTAM) IS A  
COMPUTER PROGRAM USED TO SIMULATE SOLDIERS ABILITY TO  
PERFORM IN A CONVENTIONAL AND/OR CHEMICAL WARFARE  
ENVIRONMENT. A PROGRAM CALLED TOTAM: DATA ENTRY WAS  
WRITTEN TO FACILITATE THE INPUT PROCESS TO TOTAM. THE  
REPORT INCLUDED SAMPLE RUNS OF TOTAM AND A LISTING OF  
THE COMPUTER CODE FOR THE INPUT PROGRAM.

DDC: ADB100769

SOURCE: DTIC

BIBLIOGRAPHY CITE:

P. CHUN, ET AL.; DEVELOPMENT OF AN INACTIVE PROGRAM TO  
FACILITATE DATA INPUT FOR THE RUNNING OF THE COMPUTER  
PROGRAM TOTAM, DRES-SM-1132; DEFENCE RESEARCH  
ESTABLISHMENT SUFFIELD, ALBERTA, CANADA; AUGUST 1985.

TITLE: CASCAL--A MODEL REFINEMENT FOR CHEMICAL WARFARE  
SIMULATION, NATICK/TR-82/036  
AUTHOR: J.D. CLAIBORNE, S. IMHOFF  
ORIGINATING ORG: AMAF INDUSTRIES INCORPORATED, COLUMBIA, MD, FOR US  
ARMY NATICK RESEARCH AND DEVELOPMENT LABORATORIES,  
NATICK, MA  
CLASSIFICATION: UNCLASSIFIED/LIMITED

DATE: 81/06/01  
COMMENTS: CASCAL, A COMPUTER MODEL, HAS BEEN DEVELOPED TO ADD ADDITIONAL CAPABILITIES TO EXISTING COMPUTER MODELS OF CHEMICAL WARFARE ENGAGEMENTS. CASCAL ALLOWS THE ANALYST TO ACCOUNT FOR THE EFFECTS OF PERSONNEL SHELTERS, LIQUID AGENT DEPOSITION ON VARIOUS BODY SURFACES, AND MULTIPLE ROUTES OF ENTRY. THIS REPORT DETAILS THE MATHEMATICAL MODELS FOR THE PHYSICAL PROCESSES INVOLVED. ALL ASSUMPTIONS MADE IN THE MODEL ARE STATED AND QUALIFIED. AN EXAMPLE RUN IS INCLUDED TO DEMONSTRATE THE ABILITIES OF CASCAL. THE MODEL ALSO PROVIDES INSTRUCTIONS NECESSARY TO OPERATE CASCAL WITH CHEMCAS, AN EXISTING COMPUTER MODEL. DIRECTIONS ARE ALSO GIVEN FOR OPERATING CASCAL ON A STAND-ALONE BASIS WITH A SIMPLE DRIVER PROGRAM.

BIBLIOGRAPHY:  
BIBLIOGRAPHY CITE: AAMRL-TR-87-002  
CLAIBORNE, J.D., IMHOFF, S., CASCAL--A MODEL  
REFINEMENT FOR CHEMICAL WARFARE SIMULATION,  
NATICK/TR-82/036, US ARMY NATICK RESEARCH AND  
DEVELOPMENT LABORATORIES, NATICK, MA, JUNE 1981

TITLE: MATHEMATICAL MODELING OF PERSONNEL DEGRADATION,  
VOL.II: PROGRAM DESCRIPTION FOR PDGRAM (PERSONNEL  
DEGRADATION MODEL), ARCSL-CR-79072  
AUTHOR: J.D. CLAIBORNE  
ORIGINATING ORG: CHEMICAL SYSTEMS LABORATORY(CSL), ABERDEEN PROVING  
ROUND, MD; CONTRACTOR: AMAF INDUSTRIES, INC.,  
COLUMBIA, MD  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 79/12/01  
COMMENTS: DOCUMENT DESCRIBES PROGRAM USED TO ESTIMATE PERSONNEL  
DEGRADATION SUFFERED BY MILITARY FORCES ENGAGED IN  
CHEMICAL WARFARE. THE MODEL CONSIDERS FOUR POTENTIAL  
SOURCES OF DEGRADATION - SKILL INHIBITION DUE TO  
WEARING PROTECTIVE CLOTHING; DECREASED WORK/REST RATIO  
DUE TO THE INABILITY OF THE PROTECTIVE SUIT TO  
DISSIPATE HEAT, PHYSIOLOGICAL EFFECTS OF SUB-LETHAL  
DOSES OF THE CHEMICAL AGENTS, AND OUT-OF-ACTION TIME  
DUE TO DECONTAMINATION. THE MEANING AND DETERMINATION  
OF THE VARIOUS CONCEPTS, AS WELL AS THEIR FORTRAN  
CODES, WHICH ARE USED IN THE COMPUTER PROGRAM PDGRAM  
ARE GIVEN.  
DDC: ADB043548

TITLE: FACILITATION CRITERIA FOR PILOTS OF FIXED-WING AND  
STRAIGHT-WING AIRCRAFT: PRECISION MISSION SCENARIO,  
ARCSL-TR-81083  
AUTHOR: V.R. CLARE, A.P. MICKIEWICZ  
ORIGINATING ORG: CHEMICAL SYSTEMS LABORATORY(CSL), ABERDEEN PROVING  
GROUND, MD

CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 82/06/01  
COMMENTS: THE OBJECTIVE OF THIS EFFORT WAS TO DETERMINE THE EFFECTIVENESS OF CERTAIN AMMUNITION AGAINST PILOTS OF FIXED-WING AND ROTARY-WINGED AIRCRAFT. THIS WAS ACCOMPLISHED BY DEVELOPING PROBABILITY OF INCAPACITATION ESTIMATES GIVEN A HIT. THESE PROBABILITY ESTIMATES ARE A RESULT OF A THREAT SPECTRUM GIVEN BY THE ARRADCOM COMPUTER MAN MODEL AND PILOT ESTIMATES OF PROBABILITY OF MISSION FAILURE AS A FUNCTION OF BIOMECHANICAL DEGRADATION.

TITLE: AN ANALYTICAL MODEL FOR DEVELOPING OBJECTIVE MEASURES OF AIR CREW PROFICIENCY WITH MULTIVARIATE TIME SEQUENCED DATA. VOLUME I, ANALYSIS AND RESULTS, RN 81-16

AUTHOR: E.M. CONNELLY, P. JOHNSON, B.D. SHIPLEY  
ORIGINATING ORG: PERFORMANCE MEASUREMENT ASSOCIATES, INC., VIENNA FOR ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 81/05/01  
COMMENTS: THIS REPORT PRESENTS THE THEORETICAL BASES OF AN ANALYTICAL MODEL DEVELOPED TO EVALUATE AIR CREW PERFORMANCE USING DATA FROM MULTIVARIATE TIME SEQUENCED OBSERVATIONS. THE MODEL WAS DEVELOPED TO EVALUATE ARMY AIR CREWS FLIGHT MAP OF THE EARTH.  
DDC:

ADA128070

TITLE: DETERMINATION OF HAZARD PREDICTION PROCEDURES, FINAL REPORT, GCA TECHNICAL REPORT NO. 67-8-G  
AUTHOR: H .E. CRAMER, R.K. DUMBAULD, B.R. GREENE, R.N. SWANSON  
ORIGINATING ORG: US ARMY DUGWAY PROVING GROUND (DPG), DUGWAY, UT;  
CONTRACTOR: GCA CORPORATION, BEDFORD, MA

CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 67/06/01  
COMMENTS: GENERALIZED MODELS ARE DEVELOPED FOR PREDICTING DOSAGE AND CONCENTRATION PATTERNS DOWNWIND FROM POINT OR VOLUME SOURCES, AND PROCEDURES ARE SUGGESTED FOR APPLICATION OF THE MODELS TO HAZARD ASSESSMENT

ASSOCIATED WITH CB OPERATIONS AND ACCIDENTAL RELEASES OF TOXIC MATERIALS DURING TRANSPORTATION AND STORAGE. MODEL CALCULATIONS OF DISPERSAL PATTERNS DURING STABLE STRATIFICATION AND FOR UNCOMPLICATED TERRAIN SHOW THAT THE DECREASE IN CONCENTRATION AND DOSAGE LEVELS WITH INCREASING TRAVEL DISTANCE IS PRINCIPALLY DEPENDENT ON THE DIMENSIONS OF THE SOURCE AND THE DEPTH OF THE SURFACE MIXING LAYER. IN GENERAL, THE ELONGATION OF CLOUDS IN THE DIRECTION OF TRAVEL RESULTING FROM VERTICAL WIND SHEAR PRODUCES DECREASES IN PEAK

CONCENTRATION THAT ARE LARGE COMPARED TO THE CORRESPONDING DECREASES IN DOSAGE. IT POINTED OUT THAT MODEL ESTIMATES OF CLOUD TRAVEL DISTANCE NEEDED TO REDUCE DOSAGES TO ACCEPTABLE LEVELS IN VERY STABLE REGIMES ARE MISLEADING IF THEY REQUIRE CLOUD TRAVEL TIMES LARGER THAN ABOUT 6 HOURS. THE DILUTION OF TOXIC CLOUDS BY TERRAIN AND VEGETATION FACTORS IS DISCUSSED QUALITATIVELY AND EMPIRICAL STUDIES OF DISPERSAL PROCESSES AND METEOROLOGICAL STRUCTURE REQUIRED FOR IMPROVED HAZARD-PREDICTION TECHNIQUES ARE OUTLINED.

DDC: AD818047

TITLE: A TIME-DISTRIBUTION MODEL FOR ESTIMATING CASUALTIES,  
REPORT NO. TM-73  
AUTHOR: A.R. CRAW, W.D. FOSTER  
ORIGINATING ORG: US ARMY BIOMEDICAL LABORATORY (BML), EDGEWOOD ARSENAL,  
MD  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 65/09/01  
COMMENTS: UPDATES CURRENT DIFFUSION DOSE CASUALTY MODEL THAT PREDICTS DOWNWIND DOSES AND EXPECTED CASUALTIES. THIS ANNEX INCLUDES MATHEMATICAL MODELING OF ASPIRATION, ETC., FOR INFORMATION FOR TIME TO RESPONSE. A SPECIFIC SOLUTION IS GIVEN FOR UNIFORMLY DISTRIBUTED PERSONNEL IN TARGET AREA, AND A GENERALIZED SOLUTION IS PROVIDED FOR NON-UNIFORM BUT KNOWN DISTRIBUTIONS OF PERSONNEL.  
AD472098

TITLE: TOTAL THREAT ASSESSMENT MODEL (TOTAM), ARCSL-TR-81055  
AUTHOR: G.R. CRAWFORD  
ORIGINATING ORG: CHEMICAL SYSTEMS LABORATORY(CSL), ABERDEEN PROVING GROUND, MD  
CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 82/03/01  
COMMENTS: THE MODEL TOTAL THREAT ASSESSMENT MODEL (TOTAM) IS BRIEFLY DISCUSSED. TOTAM EVALUATES THE THREAT IN A CHEMICAL WARFARE ENVIRONMENT AND/OR A HIGH-EXPLOSIVE ENVIRONMENT. THE HEAT STRESS FACTOR INVOLVED IN SUCH AN ENVIRONMENT IS CONSIDERED IN TOTAM EVALUATION.

TITLE: AIR DEFENSE SUPPRESSION EFFECTIVENESS EVALUATION, VOLUME 1  
AUTHOR: B.J. CROWE, B.M. O'ROURKE, R.E. SAWYER  
ORIGINATING ORG: FLIGHT SYSTEMS, INC., NEWPORT BEACH, CA FOR US NAVY  
CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 80/08/31  
COMMENT: DESCRIBES STUDY USING "WAR-AT-SEA" SIMULATION MODEL TO EVALUATE AN AIR STRIKE AGAINST A SMALL NAVAL TASK FORCE.

DDC: ADC029488

TITLE: GENERAL-LINEAR-MODELS APPROACH FOR COMPARING THE RESPONSE OF SEVERAL SPECIES IN ACUTE-TOXICITY TESTS, CONF-820219-3

AUTHOR: K.L. DANIELS, J.C. GOYERT, M.P. FARRELL, R.H. STRAND  
ORIGINATING ORG: OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN FOR US DEPARTMENT OF ENERGY (DOE), WASHINGTON, DC

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 82/02/19

COMMENTS: THIS PAPER PRESENTS A METHOD OF USING A GENERAL LINEAR MODEL TO COMPARE THE INTERCEPT (THRESHOLD) AND SLOPE (RESPONSE) OF DIFFERENT SPECIES TO A CHEMICAL. THIS METHOD IS SUPPOSEDLY BETTER THAN A SIMPLE COMPARISON OF LC50 VALUES. THE METHOD USES SAS GENERAL LINEAR MODEL PROCEDURE FOR CONDUCTING A WEIGHTED LEAST SQUARES ANALYSIS WITH COVARIANCE. A SAMPLE PROGRAM IS INCLUDED.

SOURCE: NTIS, DE82011442

TITLE: EVALUATION OF A CHEMICAL WEAPON SYSTEM: EXPERIMENTAL DESIGN IN THE USE OF A SIMULATION MODEL, ORG-NOTE-15

AUTHOR: I.A. DEARMON

ORIGINATING ORG: US ARMY CHEMICAL CORPS OPERATIONS RESEARCH GROUP, ARMY CHEMICAL CENTER, MD

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 64/09/01

COMMENTS: THE PHAROS (PROCEDURE FOR THE HOMOGENEOUS ANALYSIS AND RESEARCH OF OPERATIONAL SYSTEMS) ANALYSIS MODEL WAS DEVELOPED TO STUDY THE OPERATIONAL EFFECTIVENESS OF CHEMICAL WEAPON SYSTEMS. INPUT PARAMETERS FOR THE MODEL DESCRIBE THE TARGET ACQUISITION AND CHARACTERISTICS (TARGETS ARE PEOPLE IN CHEMICAL PROTECTIVE EQUIPMENT), WEAPON DELIVERY, METEOROLOGICAL CONDITIONS AND AGENT PROPERTIES. AGENT DISSEMINATION CALCULATIONS ARE THOSE OF G.H. MILLY, 1958. THE PROGRAM OUTPUT IS THE NUMBER OF CASUALTIES RESULTING FROM AN ATTACK (I.E., THE EXPECTED WEAPON EFFECTIVENESS) AND THE VARIANCE ASSOCIATED WITH THAT NUMBER. THE BODY OF THIS REPORT DESCRIBES HOW TO LIMIT THE VARIATIONS OF THE INPUT PARAMETERS WITHOUT DETRIMENTALLY AFFECTING THE FINAL VARIANCE OF THE WEAPON EFFECTIVENESS. THIS REPORT IS POORLY WRITTEN.

DDC: AD451790

SOURCE: DTIC

BIBLIOGRAPHY CITE: DEARMON, I.A., EVALUATION OF A CHEMICAL WEAPON SYSTEM: EXPERIMENTAL DESIGN IN THE USE OF A SIMULATION MODEL, ORG-NOTE-15, US ARMY CHEMICAL CORPS OPERATIONS RESEARCH GROUP, ARMY CHEMICAL CENTER, MD, SEPTEMBER 1964

**TITLE:** RESPONSE-TIME DISTRIBUTION FOR CHEMICAL AND BIOLOGICAL CASUALTIES, ORG REPORT 37

**AUTHOR:** I.A. DEARMON

**ORIGINATING ORG:** US ARMY MUNITIONS COMMAND, OPERATIONS RESEARCH GROUP, EDGEWOOD ARSENAL, MD

**CLASSIFICATION:** SECRET

**DOCUMENT DATE:** 69/07/01

**COMMENTS:** THE OBJECTIVES OF THIS REPORT WERE 1) TO CHARACTERIZATION TIME DISTRIBUTION OF CASUALTIES THAT MAY BE ATTRIBUTED TO VARIOUS CHEMICAL/BIOLOGICAL ATTACK SYSTEMS AND 2) TO EXPRESS THESE DISTRIBUTIONS IN A FORM CONVENIENT FOR COMPUTING THE EFFECTIVENESS OF CHEMICAL/BIOLOGICAL SYSTEMS. DATA WERE GATHERED FROM VARIOUS SOURCES FOR AGENTS SR, LM, DK, GB, (SARIN), VX, BZ, EA 3580, PG AND THE RELATIONS BETWEEN DOSAGE AND RESPONSE TIMES WERE ESTIMATED FOR EACH AGENT USING REGRESSION ANALYSIS TECHNIQUES. APPENDICES INCLUDE DETAILED EXAMPLES OF THE USE OF THE RESPONSE-TIME MODEL FOR DETERMINING THE TIME DISTRIBUTION OF CHEMICAL/BIOLOGICAL CASUALTIES.

**BIBLIOGRAPHY:** AAMRL-TR-87-002

**DDC:** AD503940

**BIBLIOGRAPHY CITE:** DEARMON, I.A., RESPONSE-TIME DISTRIBUTION FOR CHEMICAL AND BIOLOGICAL CASUALTIES, ORG-S-175-69, ARMY MUNITIONS COMMAND, EDGEWOOD ARSENAL, MD, JULY 1969

**TITLE:** AIRCRAFT AVAILABILITY: AN ACQUISITION DECISION STRATEGY, AFIT-LSSR-14-82

**AUTHOR:** L.M. DECKER, S.J. GUILFOOS

**ORIGINATING ORG:** SCHOOL OF SYSTEMS AND LOGISTICS, US AIR FORCE INSTITUTE OF TECHNOLOGY, WRIGHT-PATTERSON AFB, OH

**CLASSIFICATION:** UNCLASSIFIED

**DOCUMENT DATE:** 82/09/01

**COMMENTS:** THIS THESIS PRESENTS A SIMULATION MODEL WHICH WAS USED TO EVALUATE SORTIE GENERATION CAPABILITY OF A UNIT. THE MODEL WAS USED TO DETERMINE THE NUMBER OF EQUIVALENT ADDITIONAL AIRCRAFT WHICH WOULD BE REALIZED BY REDUCED AIRCRAFT MAINTENANCE TIMES, THUS INCREASING AIRCRAFT AVAILABILITY.

**DDC:** ADA123060

**TITLE:** REPRESENTATION OF TACTICAL KNOWLEDGE SHARED BY EXPERT SYSTEMS, NOSC/TD-632

**AUTHOR:** R.A. DILLARD

**ORIGINATING ORG:** NAVAL OCEAN SYSTEMS CENTER (NOSC), SAN DIEGO, CA

**CLASSIFICATION:** UNCLASSIFIED

**DOCUMENT DATE:** 83/10/01

**COMMENTS:** THIS REPORT DESCRIBES NEW PROGRESS IN THE DESIGN OF

DATA FUSION TECHNIQUES. PREVIOUS WORK RESULTED IN THE EXPERIMENTAL MODELING OF AN AUTOMATED SYSTEM. ARTIFICIAL INTELLIGENCE TECHNIQUES INCLUDED IN THE MODEL WERE: NATURAL LANGUAGE PROCESSING, RULE-BASED UPDATING OF THE SYSTEM DATABASE, AND RULE-BASED INFERENCE FOR TACTICAL DATA FUSION. EMPHASIS IN THE LATEST WORK IS ON THE SHARING OF KNOWLEDGE BY COOPERATING SUBSYSTEMS OF A COMMUNICATIONS, COMMAND AND CONTROL (C3) SYSTEM AND THE REPRESENTATION OF COMPLEX CONCEPTS. OTHER ISSUES ADDRESSED ARE THE SUBDIVISION OF MEMORY FOR DIFFERENT FUNCTIONS AND USER-ASSISTED FUSION.

DDC:

SOURCE:

ADA136875

DTIC

TITLE:

STUDY OF PASSIVE DEFENSE TECHNIQUES FOR USAF THEATER AIR BASES, AFCEC-TR-75-13

AUTHOR:

D.L. DUNBAR, J.A. KELLER

ORIGINATING ORG:

FALCON RESEARCH AND DEVELOPMENT COMPANY,  
ALBUQUERQUE, NM FOR AIR FORCE CIVIL ENGINEERING CENTER,  
TYNDALL AFB, FL

SECRET

75/08/01

THIS DOCUMENT PRESENTS THE RESULTS OF A STUDY OF THE COST EFFECTIVENESS (DOLLARS AND CAPABILITY) OF THE IMPLEMENTATION OF VARIOUS PASSIVE DEFENSIVE MEASURES. SPECIFIC TECHNIQUES EVALUATED WERE: CAMOUFLAGE, DECOYING, HARDENING, DISPERSAL, AND OBSCURATION. THE EFFECT OF BOMB DAMAGE REPAIR WAS ALSO CONSIDERED. A VERSION OF H.H. BAILEY'S VISUAL TARGET ACQUISITION MODEL WAS USED TO COMPARE SOME OF THE TECHNIQUES. THIS MODEL IS DESCRIBED IN DETAIL. THE DOCUMENT INCLUDES SEVERAL PROBABILITY OF IDENTIFICATION CURVES. IT ALSO CONTAINS WEATHER DATA FOR BITBURG AB, PRIMARILY VISIBILITY AND WIND (NO TEMPERATURE).

DDC:

ADC003678

TITLE:

CACDA JIFFY III WAR GAME, VOLUME III, CLASSIFIED DATA, CASAA-TR-7-80

AUTHOR:

S.C. ELLIOTT, C.L. PAO

ORIGINATING ORG:

ARMY COMBINED ARMS STUDIES AND ANALYSIS ACTIVITY, FORT LEAVENWORTH, KS

SECRET

80/10/01

THIS DOCUMENT CONTAINS THE CLASSIFIED DATA USED IN THE JIFFY III WAR GAME MODEL TO SUPPORT THE TRADOC SCENARIO ORIENTED RECURRING EVALUATION SYSTEM (SCORES) EFFORTS. THE DOCUMENT CONTAINS KILL PROBABILITIES, FRACTIONAL DAMAGE TABLES, EXPECTED NUMBER OF COMPLETED

FIRINGS FOR A LARGE NUMBER OF US AND SOVIET WEAPON SYSTEMS.

DDC: ADC023509

TITLE: TSAR USER'S MANUAL--A PROGRAM FOR ASSESSING THE EFFECTS OF CONVENTIONAL AND CHEMICAL ATTACKS ON SORTIE GENERATION, VOLUME II: DATA INPUT PROGRAM OPERATIONS AND REDIMENSIONING, AND SAMPLE PROBLEM, N-2242-AF

AUTHOR: D.E. EMERSON, L.H. WEGNER  
ORIGINATING ORG: RAND CORPORATION, SANTA MONICA, CA FOR US AIR FORCE, WASHINGTON, DC

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 85/08/01

COMMENTS: SEE VOLUME I FOR MODEL DESCRIPTION. THIS VOLUME OF THE USER'S MANUAL DESCRIBES THE INPUT REQUIRED BY THE THEATER SIMULATION OF AIR BASE RESOURCES (TSAR) MODEL, THE FORMAT OF THE INPUT DATA, AND CONTAINS A COMPLETE LISTING OF THE INPUT FOR A SAMPLE PROBLEM AND THE TSAR GENERATED OUTPUT FOR THAT SAMPLE PROBLEM.

RAND

SOURCE: BIBLIOGRAPHY CITE: EMERSON, D.E. AND WEGNER, L.H., TSAR USER'S MANUAL--A PROGRAM FOR ASSESSING THE EFFECTS OF CONVENTIONAL AND CHEMICAL ATTACKS ON SORTIE GENERATION, VOLUME II:DATA INPUT PROGRAM OPERATIONS AND REDIMENSIONING, AND SAMPLE PROBLEM, N-2242-AF, US AIR FORCE, WASHINGTON, DC, AUGUST 1985

TITLE: INTEGRATED BATTLEFIELD EFFECTS RESEARCH FOR THE NATIONAL TRAINING CENTER, APPENDIX B: REQUIREMENTS DESIGN SPECIFICATION FOR THE ADDITION OF NUCLEAR AND CHEMICAL, DNA-TR-85-13

AUTHOR: D. ERICKSON, J. ICKLER, P. MCKEOWN, L. METZGER, R. PLOCK, B. PACKARD, J. BIRNEY

ORIGINATING ORG: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC), LA JOLLA, CA FOR DEFENSE NUCLEAR AGENCY (DNA), WASHINGTON, DC

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 84/12/31

COMMENTS: APPENDIX B CONTAINS THE REQUIREMENTS DESIGN SPECIFICATION FOR THE ADDITION OF NUCLEAR AND CHEMICAL EFFECTS INTO THE INTEGRATED BATTLEFIELD TRAINING SYSTEM AT THE US ARMY NATIONAL TRAINING CENTER. CONTENTS INCLUDE: FUNCTIONAL REQUIREMENTS, SOFTWARE DESIGN REQUIREMENTS, INTERACTIVE DISPLAY AND CONTROL COMPONENT OVERVIEW, NUCLEAR AND CHEMICAL EFFECTS ALGORITHMS. ATTACHMENT 2 CONTAINS THE ALGORITHMS USED FOR CALCULATING THE CHEMICAL ENVIRONMENT IN THE MODEL.

DDC: ADA166022

SOURCE: DTIC

BIBLIOGRAPHY CITE:

ERICKSON, D., ET AL., INTEGRATED BATTLEFIELD EFFECTS RESEARCH FOR THE NATIONAL TRAINING CENTER, APPENDIX B: REQUIREMENTS DESIGN SPECIFICATION FOR THE ADDITION OF NUCLEAR AND CHEMICAL, DNA-TR-85-13, DEFENSE NUCLEAR AGENCY (DNA), WASHINGTON, DC, DECEMBER 1984

TITLE:

MEASUREMENT OF THE COMBINED HEAT AND WATER-VAPOUR FLOW THROUGH CLOTHING UNDER TRANSIENT CONDITIONS, TR 82-13

AUTHOR:

B. FARNWORTH, B. NORDLI

ORIGINATING ORG:

DEFENCE RESEARCH ESTABLISHMENT OTTAWA, CANADA

CLASSIFICATION:

UNCLASSIFIED

DOCUMENT DATE:

82/03/01

COMMENTS:

A SWEATING HOT PLATE FOR THE STUDY OF COMBINED HEAT AND WATER-VAPOUR FLOW THROUGH CLOTHING UNDER TRANSIENT CONDITIONS IS DESCRIBED. THE RESULTS ARE IN GOOD AGREEMENT WITH THE MATHEMATICAL MODEL REPORTED IN A PREVIOUS PAPER FOR SEVERAL MODEL CLOTHING SYSTEMS. THE HEAT LOSS THROUGH WOOL WAS FOUND TO BE SMALLER THAN THAT THROUGH SIMILAR POLYESTER CLOTHING DURING PERIODS OF SWEATING AND LARGER DURING SUBSEQUENT PERIODS OF DRYING, BECAUSE OF THE EFFECTS OF ABSORPTION OF WATER VAPOUR BY HYGROSCOPIC MATERIALS. A COMPARISON WAS MADE OF THE HEAT AND VAPOUR TRANSMISSION OF THE CLOTHING SYSTEMS BY INCORPORATING A VAPOUR-IMPERMEABLE FABRIC OR THE WATERPROOF BUT VAPOUR-PERMEABLE FABRIC GORE-TEX. LIQUID WATER WAS OBSERVED TO CONDENSE ON THE INNER SURFACE OF BOTH FABRICS DURING PERIODS OF SWEATING BUT THE GORE-TEX DRIED WITHIN A FEW MINUTES OF THE END OF THE SWEATING PERIOD. GORE-TEX WAS FOUND TO BE VAPOUR-PERMEABLE EVEN AT TEMPERATURES BELOW 0 C WHEN FROST WAS FORMING ON ITS INNER SURFACE.

TITLE:

THE THERMAL RESISTANCE OF THE CF CW SUIT,  
DREO-TN-85-22

AUTHOR:

B. FARNWORTH, S.D. LIVINGSTONE

ORIGINATING ORG:

DEFENCE RESEARCH ESTABLISHMENT OTTAWA, ONTARIO, CANADA

CLASSIFICATION:

UNCLASSIFIED

DOCUMENT DATE:

85/05/01

COMMENTS:

THIS DOCUMENT GIVES THE CONCLUSIONS OF THE TESTING OF A MODEL THAT PREDICTS THERMAL RESISTIVITY IN THE CANADIAN FORCES CW SUIT. THE MODEL IS BASED ON MEASURED RESISTANCES OF THE FABRIC LAYERS AND ESTIMATED VALUES FOR INTERNAL AND EXTERNAL STILL AIR LAYERS. THIS MODEL WAS COMPARED TO ACTUAL PHYSIOLOGICAL TESTING AND FOUND TO MAKE THE DESIRED PREDICTIONS. IT WAS NOTED THAT THE RESULTS SUGGEST MODEL CALCULATIONS COULD BE MADE TO GIVE SENSIBLE HEAT LOSS IN A VARIETY OF CONDITIONS AND THE EVAPORATIVE HEAT LOSS WITH SOME CONFIDENCE.

TITLE: PERSPIRATION POISONING OF PROTECTIVE CLOTHING MATERIALS, PART II - MATHEMATICAL MODEL FOR A COMPLEX ADSORPTION BED, TR-75-55-CEMEL

AUTHOR: J.K. FERRELL, M.R. BRANSCOME, R.W. ROUSSEAU

ORIGINATING ORG: NORTH CAROLINA STATE UNIVERSITY, RALEIGH, NC FOR US ARMY NATICK R&D COMMAND, NATICK, MA

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 74/06/01

COMMENTS: A MATHEMATICAL MODEL WAS DEVELOPED USING THE METHOD OF MOMENTS FOR THE ABSORPTION OF CARBON TETRACHLORIDE VAPOR BY CARBON IMPREGNATED FOAM MATERIAL. THE REPORT PROVIDES A DESCRIPTION OF THE THEORY USED TO DESIGN THE MODEL, AND A COMPARISON OF EXPERIMENTAL AND MODEL-PREDICTED DATA FOR BREAKTHROUGH TIMES.

DDC: ADA100235

TITLE: DEVELOPMENT OF A TAXONOMY OF HUMAN PERFORMANCE: A REVIEW OF THE SECOND YEAR'S PROGRESS, AFOSR-70-0928TR

AUTHOR: E.A. FLEISHMAN, W.H. TEICHNER, R.W. STEPHENSON

ORIGINATING ORG: AMERICAN INSTITUTES FOR RESEARCH, PITTSBURGH, PA FOR AIR FORCE OFFICE OF SCIENTIFIC RESEARCH, ARLINGTON, VA

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 70/01/01

COMMENTS: THIS IS A REVIEW OF THE SECOND YEAR CONTRACTUAL EFFORT ON THE NEED FOR DIFFERENT TASK TAXONOMIC SYSTEMS TO MEET THE NEEDS OF MILITARY USERS. THREE APPROACHES WERE SELECTED: 1) ABILITY-REQUIREMENT APPROACH, 2) TASK CHARACTERISTICS APPROACH, AND 3) SYSTEMS-LANGUAGE MODEL. FINALLY, A SPECIALLY SELECTED HUMAN PERFORMANCE DATA BASE WAS ASSEMBLED.

DDC: AD705671

TITLE: PREDICTING THE EFFECTIVENESS OF CONCEPTS FOR FUTURE MARINE CORPS MEDICAL SUPPORT SYSTEMS: PRELIMINARY REPORTS

AUTHOR: J.R. FLETCHER, P.B. RICHARDS

ORIGINATING ORG: NAVAL RESEARCH LABORATORY, WASHINGTON, DC

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 81/12/10

COMMENTS: THIS IS A PRELIMINARY ATTEMPT TO IDENTIFY OPTIONS FOR OVERCOMING DELAYS IN PROVIDING EMERGENCY, LIFE SAVING MEDICAL CARE IN A MASS CASUALTY SITUATION. THE NAVY/MARINE CORPS PLANS FOR SUPPORTING MARINE CORPS COMBAT OPERATIONS IN THE 1984-1993 TIME PERIOD WERE ANALYZED BY MEANS OF THE NAVY'S WMMSS(WORLD-WIDE) MILITARY MEDICAL SUPPORT SYSTEM) SIMULATION MODEL. PROJECTED PATIENT LOADS WERE APPROXIMATELY 1400 CASUALTIES ON D-DAY FOLLOWED BY 400 PER DAY THEREAFTER, IN A CONVENTIONAL WARFARE ENVIRONMENT. WITH VARIOUS CHANGES IN PROCEDURES AND RESOURCES FROM

THE CURRENTLY PLANNED PERSONNEL AND PROCEDURES, PEAK LOAD MORTALITY CAN BE REDUCED FROM 26 PERCENT TO ELEVEN PERCENT OR LESS AND STEADY-STATE MORTALITY CAN BE REDUCED FROM EIGHT PERCENT TO THREE PERCENT OR LESS. OTHER FINDINGS ARE THAT KEY PERSONNEL ARE OVERWORKED AND BED SHORTAGES EXIST.

DDC:  
ADA108837

TITLE: DEVELOPMENT OF GENERIC CREW MEMBER PROBABILITY OF DAMAGE GIVEN A HIT RELATIONS, ASD-TR-79-5005  
AUTHOR: J.J. FLOWERS  
ORIGINATING ORG: MARTIN MARIETTA CORP., ORLANDO DIVISION, FL  
CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 79/05/01  
COMMENTS: A COMBINED STUDY OF AIRCREW FUNCTIONAL REQUIREMENTS, INCAPACITATION RELATIONSHIP AND GENERIC CREW MEMBER MODELING RESULTED IN AN ASSESSMENT PROCEDURE AND SUPPORTING DATA FOR DEVELOPMENT OF PROBABILITY OF DAMAGE GIVEN A HIT RELATIONSHIPS FOR GENERIC PILOT/COPILOT MODELS OF FIXED-AND ROTARY-WING AIRCRAFT, AND FOR A GENERIC NAVIGATOR/WEAPON SYSTEM BOMBADIER MODEL.

DDC:  
ADC018243

TITLE: EVALUATION OF INCAPACITATING CHEMICAL AND BIOLOGICAL ANTIPERSONNEL AGENTS, AFATL-TR-69-5  
AUTHOR: D.G. FRIER, J.G. COLYER, E.E. FORCE  
ORIGINATING ORG: BOOZ-ALLEN APPLIED RESEARCH INC., EGLIN AFB, FL FOR AIR FORCE ARMAMENT LABORATORY, EGLIN AFB, FL  
CLASSIFICATION: SECRET  
DOCUMENT DATE: 69/01/28  
COMMENTS: THE FOLLOWING INCAPACITATING AGENTS WERE EVALUATED: CS, BZ, PG, DK, AND LM. A PROCEDURE WAS DEVELOPED TO EVALUATE THE EFFECTS OF INCAPACITATING AGENTS ON INDIVIDUAL, CREW, AND UNIT COMBAT PERFORMANCES USING MODELS. THE MODEL RANKS ORDER OF THE AGENTS BY THEIR ESTIMATED EFFECT ON PERFORMANCE.

DDC:  
AD505026

TITLE: PSYCHOLOGICAL CORRELATES OF A MODEL OF THE HUMAN VISUAL SYSTEM, GE/EE/715-2  
AUTHOR: A.P. GINSBURG  
ORIGINATING ORG: AIR FORCE INSTITUTE OF TECHNOLOGY  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 71/06/01  
COMMENTS: A MODEL OF THE HUMAN VISUAL SYSTEM IS INVESTIGATED FOR PSYCHOLOGICAL CORRELATES. A PRIOR HYPOTHESES FROM THE MODEL CONCERNED WITH HUMAN IDENTIFICATION OF DEFUSED

DDC:

LETTERS AS WELL AS IDENTIFICATION OF ROTATED LETTERS HAVE BEEN VALIDATED WITH THE COMPUTER MODEL.  
AD731197

TITLE:

DEVELOPMENT OF A SPEECH AMPLIFIER SYSTEM FOR USE WITH THE NAVY A4 OXYGEN BREATHING APPARATUS AND A PROPOSED FIREFIGHTING INSTRUCTOR'S BREATHING DEVICE

AUTHOR:

T.A. GIORDANO

ORIGINATING ORG:

EPSCO LABORATORIES, WILTON, CT FOR NAVAL SHIP ENGINEERING CENTER, HYATTSVILLE, MD

CLASSIFICATION:

UNCLASSIFIED

DOCUMENT DATE:

76/04/01

COMMENTS:

DOCUMENT DESCRIBES A STUDY IN WHICH THE NAVY'S A30BA AND A40BA OXYGEN BREATHING APPARATUS WERE PROVIDED WITH SUITABLE VOICE AMPLIFIERS. THE SPEECH PROJECTION SYSTEM DEVELOPED IN THIS PROGRAM CONSISTS BASICALLY OF TWO PARTS: THE MICROPHONE MOUNTING BRACKET, AND THE UNIT WHICH CONTAINS BOTH THE ELECTRONICS AND THE LOUD SPEAKER. THE VOICE AMPLIFIER PERFORMED WELL AND THE MODEL WILL GIVE THE USER THE ABILITY TO COMMUNICATE INTELLIGIBLY WITH THOSE AROUND HIM, EVEN IN HIGH AMBIENT NOISE LEVELS.

DDC:

ADA025184

SOURCE:

DTIC

BIBLIOGRAPHY CITE:

GIORDANO, T.A., DEVELOPMENT OF A SPEECH AMPLIFIER SYSTEM FOR USE WITH THE NAVY A4 OXYGEN BREATHING APPARATUS AND A PROPOSED FIREFIGHTING INSTRUCTOR'S BREATHING DEVICE, NAVAL SHIP ENGINEERING CENTER, HYATTSVILLE, MD, APRIL 1976

TITLE:

PREDICTING RECTAL TEMPERATURE RESPONSE TO WORK, ENVIRONMENT AND CLOTHING

AUTHOR:

B. GIVONI, R.F. GOLDMAN

ORIGINATING ORG:

US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE(ARIEM), NATICK, MA, JOURNAL OF APPLIED PHYSIOLOGY, 1972, 32, 812-822

CLASSIFICATION:

UNCLASSIFIED

DOCUMENT DATE:

72/06/01

COMMENTS:

THIS PAPER PRESENTS THE DEVELOPMENT AND DEMONSTRATES THE VALIDITY OF A BIOPHYSICAL MODEL OF THE EFFECT OF REST OR WORK AT VARIOUS LEVELS, CLOTHING, TEMPERATURE, HUMIDITY AND WIND, AND THEIR INTERACTION, ON THE PATTERN AND MAGNITUDE OF CHANGES IN RECTAL TEMPERATURE IN COMFORTABLY WARM OR HOTTER SITUATIONS.

TITLE:

A STUDY OF IMPROVED METHODS OF CALCULATING GROUND CONTAMINATION DENSITY AND CASUALTY RATE FOR NONEVAPORATING LIQUID, REPORT NO. SU66CR1

AUTHOR:

D.L. GOTTLIEB

ORIGINATING ORG: THE UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA, PA FOR US ARMY MUCOM OPERATIONS RESEARCH GROUP, EDGEWOOD ARSENAL, MD

CLASSIFICATION: CONFIDENTIAL

DOCUMENT DATE: 66/11/01

COMMENTS: GENERALIZATION OF THE ARMOUR MODEL ARE DEVELOPED FOR DOWNWIND CONTAMINATION AND CASUALTY RATES FROM ELEVATED SPRAY LINE OF NONEVAPORATING LIQUIDS. THE EFFECTS IN VARIATION OF MODEL PARAMETERS IS EXAMINED. AS THE CONDITIONS OF DISSEMINATION RESULT IN SMALLER VOLUME MODEL DIAMETERS, THE DROPLET SIZE DISTRIBUTIONS ARE NARROWED, AND THE PREDICTED DISTANCES TO THE POINTS OF MAXIMUM DENSITY AND TO CONTOURS OF SPECIFIED CONCENTRATIONS AND CASUALTY RATES ARE INCREASED. A GRAPHICAL METHOD FOR PREDICTING DOWNWIND AREA COVERAGE TO SPECIFIED LEVELS OF CONTAMINATION PROVIDES A PROCEDURE FOR MAKING SUCH COMPUTATIONS WITH A MINIMUM OF NUMERICAL CALCULATION.

DDC: AD378774

TITLE: THE SORTIE-GENERATION MODEL SYSTEM, VOLUME V. THE MAINTENANCE SUBSYSTEM

AUTHOR: R.S. GREENBERG

ORIGINATING ORG: ASSISTANT SECRETARY OF DEFENSE (MANPOWER, RESERVE AFFAIRS, AND LOGISTICS), THE PENTAGON, WASHINGTON DC

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 81/09/30

COMMENTS: DESCRIBES THE MAINTENANCE SUBSYSTEM THAT ESTIMATES THE MAINTENANCE MANPOWER AND PERFORMANCE PARAMETERS FOR THE QUEUING MODEL EMBEDDED IN THE SORTIE-GENERATION MODEL SYSTEM. THIS SUBSYSTEM ESTIMATES THE FAILURE RATE, SERVICE RATE, AND NUMBER OF SERVERS FOR EACH WORK CENTER IN A MAINTENANCE ORGANIZATION. EXPLAINS THE STEPS REQUIRED TO CREATE THE MAINTENANCE INPUT FILE USING THE LMI, MODIFIED VERSION OF COMMON DATA EXTRACTION PROGRAMS (CDEP). MEANT TO BE USED WITH THE OTHER FOUR VOLUMES IN THE SET.

DDC: ADA110815

TITLE: EXPECTED AREA COVERAGE FOR M117 SERIES VX-FILLED BOMBS, DPG-TA-85-10

AUTHOR: B.S. GRIM, J.E. RAFFERTY

ORIGINATING ORG: DUGWAY PROVING GROUND (DPG), DUGWAY, UT

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 85/09/01

COMMENTS: FIELD TRIALS OF VX-FILLED AND SIMULANT-FILLED MUNITIONS WERE COMPARED WITH MODEL PREDICTIONS TO DETERMINE THE BEST ESTIMATE FOR AREA COVERAGE. THE CONCLUSIONS ARE: (1) FROM AN OPERATIONAL STANDPOINT

THE BEST ESTIMATE FOR EFFECTIVE AREA COVERAGE (DEFINED AS ONE LD30 = 100 MG/M<sup>2</sup> FOR NORMALLY CLAD TROOPS) FROM ONE AIRBURSTED M117 SERIES VX-FILLED BOMB IS 6HA., (2) DEPENDING ON RELEASE HEIGHT AND THE ENVIRONMENTAL AND WEATHER CONDITIONS, THE ACTUAL AREA COVERAGE COULD POSSIBLY BE 2 TO 3 TIMES HIGHER OR LOWER THAN THE 6HA. AVERAGE (DEMONSTRATED BY THE GREAT VARIABILITY OF THE DATA FROM FIELD TRIALS), (3) A BURST HEIGHT OF 100 TO 400M WOULD BE OPTIMUM FOR AVERAGE WEATHER CONDITIONS AND AN ASSUMED DROPLET MASS MEDIAN DIAMETER OF 0.33 MINUTES, (4) THE AVERAGE TOUCHDOWN DISTANCE TO THE EFFECTIVE AREA (100 MG/M<sup>2</sup> ISOPELTH) WILL BE ABOUT 500M DOWNWIND OF THE BURST POINT FOR NEUTRAL CONDITIONS, AND (5) THE EFFECTIVE AREA WILL TYPICALLY BE 90M WIDE AND 700M LONG.

DDC:

ADB097289

TITLE: COMPARISON OF CIVILIAN CASUALTIES RESULTING FROM CONVENTIONAL AND CHEMICAL WEAPONS USING THE TACWAR THEATER COMBAT MODEL, IDA-P-1792  
AUTHOR: J.H. GROTE, J.N. FRY, L.A. SCHMIDT, L. WAINSTEIN  
ORIGINATING ORG: INSTITUTE FOR DEFENSE ANALYSES, ALEXANDRIA, VA FOR DEFENSE NUCLEAR AGENCY, WASHINGTON, DC  
CLASSIFICATION: SECRET  
DOCUMENT DATE: 85/01/01  
COMMENTS: THIS STUDY DEVELOPED AND IMPLEMENTED A METHODOLOGY TO ESTIMATE CIVILIAN CASUALTIES FROM CONVENTIONAL MUNITION. THE METHODOLOGY WAS INCORPORATED WITH TACWAR MODEL CODE AND USED TO ESTIMATE THE CONTRIBUTION OF CONVENTIONAL AS WELL AS CHEMICAL WEAPONS TO CIVILIAN CASUALTIES IN THE EUROPEAN THEATER. EXAMPLE RUNS WERE MADE USING A 1986 EUROPEAN DATA BASE TO COMPARE CIVILIAN CASUALTIES RESULTING FROM CONVENTIONAL AND CHEMICAL WEAPONS. THE METHODOLOGY USED TO CALCULATE CHEMICAL CASUALTIES IS NOT EXPLAINED. DATA ARE PRESENTED ON CIVILIAN CASUALTIES FROM WORLD WAR II, VIETNAM, THE FALKLAND WAR AND OTHERS.  
DDC: ADC036868  
SOURCE: DTIC  
BIBLIOGRAPHY CITE: GROTE, J.H., FRY, J.N., SCHMIDT, L.A. AND WAINSTEIN, L., COMPARISON OF CIVILIAN CASUALTIES RESULTING FROM CONVENTIONAL AND CHEMICAL WEAPONS USING THE TACWAR THEATER COMBAT MODEL (U), IDA-P-1792, DEFENSE NUCLEAR AGENCY, WASHINGTON, DC, JANUARY 1985  
  
TITLE: CATALOG OF WARGAMING AND MILITARY SIMULATION MODELS, JADAM-270-86  
AUTHOR: J.A. GUIRRERI  
ORIGINATING ORG: JOINT CHIEFS OF STAFF, WASHINGTON, DC  
CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 86/05/01  
COMMENTS: LISTS THE DESCRIPTIONS OF OVER 600 SIMULATIONS, WAR GAMES, EXERCISES AND MODELS IN GENERAL USE THROUGHOUT THE DEPARTMENT OF DEFENSE AND IN DEFENSE ESTABLISHMENTS OF AUSTRALIA, CANADA, ENGLAND AND GERMANY. ENTRIES ARE LISTED ALPHABETICALLY BY ACRONYM AND LONG TITLE. THE DESCRIPTION OF EACH MODEL INCLUDES PROPOSER, DEVELOPER, PURPOSE, GENERAL DESCRIPTION, INPUT, OUTPUT, LIMITATIONS, HARDWARE, SOFTWARE, TIME REQUIREMENTS, SECURITY CLASSIFICATION OF THE MODEL (LESS DATA), FREQUENCY OF USE, AND POINT OF CONTACT FOR ADDITIONAL INFORMATION. THE CATALOG DRAWS UPON INPUTS FROM ANALYSIS AGENCIES IN THE VARIOUS DEFENSE ESTABLISHMENTS, INDEPENDENT CONTRACTORS AND RESEARCH ORGANIZATIONS, AND SIMILAR CATALOGS OF GAMES AND SIMULATIONS. DATE REVISED IS 1986. THIS PUBLICATION, THE 10TH EDITION, SUPERCEDES PREVIOUS EDITIONS.

DDC ADA169472  
SOURCE: DTIC  
BIBLIOGRAPHY CITE: GUIRREI, J.A., CATALOG OF WARGAMING AND MILITARY SIMULATION MODELS, JADAM-270-86, JOINT CHIEFS OF STAFF, WASHINGTON, DC, MAY 1986

TITLE: CASUALTY PROBABILITY ESTIMATES FOR VARIOUS SIZE TARGETS USING CHEMICAL MUNITIONS, DPG-FR-A110P  
AUTHOR: D.L. HANSEN  
ORIGINATING ORG: DUGWAY PROVING GROUND(DPG), DUGWAY, UT  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 74/08/01  
COMMENTS: DESCRIBES THE USE OF THE TECA/TRACE MODEL TO ESTIMATE CASUALTIES AS A FUNCTION OF TIME AND NUMBER OF MUNITIONS EXPENDED FOR VARIOUS SIZE TARGETS. DELIVERY ERRORS, METEOROLOGICAL CONDITIONS, TERRAIN AND ENVIRONMENT ARE ALL CONSIDERED. FORTRAN SOURCE CODE AND OUTPUT IS INCLUDED.

DDC AD921555

TITLE: A DEGRADATION ANALYSIS METHODOLOGY FOR MAINTENANCE TASKS  
AUTHOR: D.W. HARRIS  
ORIGINATING ORG: ARMY MILITARY PERSONNEL CENTER, ALEXANDRIA, VA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 85/05/01  
COMMENTS: THIS THESIS PROPOSES A METHODOLOGY FOR ESTIMATING THE MECHANICAL DEGRADATION OF INDIVIDUALS WHEN WEARING CHEMICAL PROTECTIVE CLOTHING. THE OVERALL GOAL OF THIS DECISION MODEL IS TO ACCOUNT FOR THE MAJORITY OF TASK-TIME DEGRADATION NOT TOTAL TASK TIME. VERY GOOD DISCUSSION OF THE PROBLEM.

DDC ADA155073

TITLE: HIGHER MENTAL FUNCTIONING IN OPERATIONAL ENVIRONMENTS,  
AGARD-CP-181, ISBN 92-835-1216-2  
AUTHOR: B.O. HARTMAN, S.J. GERATHEWOLD, R.C. MCNEE, R.A.  
ORIGINATING ORG: ALBANESE, W.G. JACKSON, ET AL  
ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT,  
NATO  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 76/04/01  
COMMENTS: THIS DOCUMENT INCLUDES THE ELEVEN PAPERS PRESENTED AT  
THE AEROSPACE MEDICAL PANEL SPECIALISTS MEETING HELD  
IN ANKARA, TURKEY, ON 21 OCTOBER 1975. TOPICS INCLUDED  
WORKLOAD MEASUREMENT, PERFORMANCE MEASUREMENT,  
CIRCADIAN PERFORMANCE RHYTHMS, THE EFFECT OF EMOTIONAL  
STRESS ON FLYING EFFICIENCY, AND A MODEL FOR THE  
EFFECTS OF OPERATIONAL STRESS. THERE IS GENERAL  
AGREEMENT AMONG MILITARY BEHAVIORAL SCIENTISTS THAT  
OPERATIONAL STRESS AFFECTS HIGHER MENTAL FUNCTIONS  
MORE THAN THE SIMPLER LEVELS OF PERCEPTUAL MOTOR  
BEHAVIOR. A NUMBER OF PILOTING AS WELL AS NON-PILOTING  
JOBS ARE VULNERABLE TO THIS SORT OF PERFORMANCE  
IMPAIRMENT. IN GENERAL, FEW LABORATORIES ARE STUDYING  
BEHAVIOR AT THESE MORE COMPLEX LEVELS.

DDC: ADA025663

TITLE: A SIMULATION OF INFORMATION LOAD AND ITS AFFECT ON  
TACTICAL DECISION MAKING  
AUTHOR: C.C. HASSLER  
ORIGINATING ORG: NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 83/06/01  
COMMENTS: THIS DOCUMENT EXAMINES THE PROBLEMS ASSOCIATED WITH  
MAKING USEFUL DECISIONS WHEN DEALING WITH AN ABUNDANCE  
OF INFORMATION. THE DOCUMENT PROVIDES A LITERATURE  
REVIEW OF 50 GOVERNMENT STUDIES ON DECISION MAKING,  
TACTICAL DECISION AIDS, TACTICAL INFORMATION  
REQUIREMENTS ANALYSIS, MODELING CRITERIA AND  
ORGANIZATIONAL BEHAVIOR. A MODEL WHICH SIMULATES  
INFORMATION USAGE BY SIMULATING THE EFFECTS OF VARIOUS  
LEVELS OF INFORMATION LOAD ON THE CHOICE PROCESS WAS  
DEVELOPED.

DDC: ADA133182

TITLE: HUMAN FACTORS RESEARCH SIMULATOR, HEL-TM-8-87  
AUTHOR: G.L. HERALD  
ORIGINATING ORG: HUMAN ENGINEERING LABORATORY (HEL), ABERDEEN PROVING  
GROUND, MD  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 87/03/01  
COMMENTS: DESCRIBES A SIMULATOR SYSTEM WITH TERRAIN IMAGING  
CAPABILITIES USED FOR VARIOUS ARMY HUMAN FACTORS

RESEARCH. MERGER OF SUCH ADVANCED TECHNOLOGICAL CAPABILITIES WILL PERMIT THE HUMAN FACTORS RESEARCH SIMULATOR TO MODEL INCREASINGLY SOPHISTICATED SOLDIER-MACHINE INTERFACES. GENERAL HUMAN FACTORS DESIGN PROBLEMS AND CONSIDERATIONS REGARDING AVIATION AND AIR DEFENSE SIMULATORS ARE DISCUSSED. AN EXAMPLE OF AN AVIATION BASELINE SYSTEM IS INCLUDED.

SOURCE:  
BIBLIOGRAPHY CITE:

HEL  
HERALD, G.L., HUMAN FACTORS RESEARCH SIMULATOR,  
HEL-TM-8-87, HUMAN ENGINEERING LABORATORY (HEL),  
ABERDEEN PROVING GROUND, MD, MARCH 1987

TITLE:  
AUTHOR:  
ORIGINATING ORG:  
CLASSIFICATION:  
DOCUMENT DATE:  
COMMENTS:

TECHNICAL REPORT NO. 526.06, CW MATHEMATICAL OPERATIONS RESEARCH; FINAL REPORT, PART I  
L.H. HERBACH, L. ROSENBERG  
US ARMY CHEMICAL RESEARCH AND DEVELOPMENT LABORATORY,  
ARSENAL; NEW YORK UNIVERSITY, COLLEGE OF  
ENGINEERING, RESEARCH DIVISION  
UNCLASSIFIED/LIMITED  
67/01/13  
THIS REPORT DESCRIBES THE MATHEMATICAL FOUNDATIONS OF REQUIRED FOR THE ADAPTATION OF A CASUALTY MODEL (CASUALTY PRODUCTION II) FROM THE INFINITE AREA CASE TO THE FINITE AREA CASE. DISTRIBUTIONS OF MEN AND MUNITIONS IN THE TARGET AREA ARE CONSIDERED. A-D CURVES ARE CONSIDERED. THE TECHNIQUES FOR ESTIMATING THE HIGH ORDER MOMENTS OF A DOSAGE DISTRIBUTION FUNCTION TO PRODUCE AN A-D CURVE ARE PRESENTED. THE PRESENTATION OF THE UNDERLYING MATHEMATICS OF CASUALTY MODELLING IS EXCELLENT.

DDC:  
AD814794

TITLE:  
AUTHOR:  
ORIGINATING ORG:  
CLASSIFICATION:  
DOCUMENT DATE:  
COMMENTS:

COMPARISON OF CW ATTACK STUDIES ON AIRBASES  
C.E. HOLMAN  
STUDIES AND ANALYSES, WASHINGTON, DC  
SECRET  
84/07/01  
THIS BRIEFING COMPARES AND CONTRASTS STUDIES ON CHEMICAL ATTACKS ON AIRBASES. IT LOOKS AT STUDIES FROM: RAND, BURDESHAW, INSTITUTE FOR DEFENSE ANALYSES (IDA), AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY (AFAMRL), AND OTHERS. IT PRESENTS THE BASIC CHEMICAL ATTACK/SORTIE GENERATION MODEL, DATA QUALITY, DATA, RESULTS AND MAKES OBSERVATIONS ON THE STUDIES. MODEL REFINEMENT AND VERIFICATION AS WELL AS DATA REFINEMENT ARE SUGGESTED.

BIBLIOGRAPHY CITE:

C.E. HOLMAN; COMPARISON OF CW ATTACK STUDIES ON AIRBASES; STUDIES AND ANALYSES, WASHINGTON, DC; JULY 1984; SECRET.

TITLE: MARINE CORPS REQUIREMENTS AND PROCEDURES FOR DECONTAMINATION AND COLLECTIVE PROTECTION, ANNEX A

AUTHOR: G.W. HUGHES

ORIGINATING ORG: MARINE CORPS, WASHINGTON, DC

CLASSIFICATION: SECRET

DOCUMENT DATE: 82/08/27

COMMENTS: THIS DOCUMENT PROVIDES AN ANALYSIS OF THE EFFECTS OF CHEMICAL WARFARE AGAINST A MARINE AIR-GROUND TASK FORCE (MAGTF) IN THE MARLORS-1 SCENARIO. THE DOCUMENT FIRST DESCRIBES THE ASSAULT SCENARIOS USED IN THE ANALYSIS, THEN DESCRIBES THE ENSUING CONCEPT OF OPERATIONS. DATA IS THEN PRESENTED WHICH DESCRIBE ESTIMATES OF CASUALTIES UNDER VARIOUS MET CONDITIONS AND AGENT TYPES. IT IS UNCLEAR AS TO HOW THE DATA WAS ARRIVED AT, AS NO METHODOLOGY OR MODEL DESCRIPTION IS PROVIDED. BASIC CODE IS PROVIDED FOR THE CAT AGENT SIMULATION PROGRAM.

DDC: ADC036809

TITLE: INTERACTIVE EFFECTS OF HEAT LOAD AND RESPIRATORY STRESS ON WORK PERFORMANCE OF MEN WEARING CB PROTECTIVE EQUIPMENT

AUTHOR: A.T. JOHNSON, H.M. BERLIN

ORIGINATING ORG: EDGEWOOD ARSENAL, ABERDEEN PROVING GROUND MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 73/12/01

COMMENTS: STUDY TO OBJECTIVELY ASSESS THE MAGNITUDE OF THE INTERACTIVE EFFECTS OF HEAT AND RESPIRATORY STRESSES. A MODEL IS PROPOSED WHICH IS CONSISTENT WITH THE RESULTS AND WHICH DEFINES THE STRESS LIMITATIONS FOR DIFFERENT RATES OF EXERCISE. WITH THE USE OF THIS MODEL, THE VALUE OF .1 MM 20-MU/LITER HAS BEEN OBJECTIVELY DEFINED AS THE MINIMUM EFFECTUAL PROTECTIVE MASK AIRFLOW RESISTANCE.

DDC: AD771931

TITLE: THE ENERGETICS OF MASK WEAR

AUTHOR: A.T. JOHNSON

ORIGINATING ORG: AGRICULTURAL ENGINEERING DEPARTMENT, UNIVERSITY OF MARYLAND, COLLEGE PARK, MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 76/08/01

COMMENTS: A STUDY TO DEFINE THE REGION WHERE RESPIRATORS (MASKS) ARE MOST RESTRICTIVE OF THE WEARER. WITHIN THIS REGION, ENERGY CONSIDERATIONS CAN BE USED TO DEFINE A MODEL WHICH PREDICTS EFFECTS OF VARIATIONS IN RESPIRATOR PARAMETERS OF PERFORMANCE TIME OF THE MAN WEARING THE MASK. EXPERIMENTAL DATA PROVIDED.

TITLE: DEVELOPMENT OF A DATA BASE FOR THE CHEMICAL WARFARE STUDY, IDA-S-489

AUTHOR: E.P. KERLIN

ORIGINATING ORG: INSTITUTE FOR DEFENSE ANALYSIS FOR THE JOINT CHIEFS OF STAFF, WASHINGTON, DC

CLASSIFICATION: SECRET

DOCUMENT DATE: 79/07/01

COMMENTS: THIS REPORT DESCRIBES A PHASE I STUDY ON THE EFFECTS OF CHEMICAL WARFARE ON A THEATER LEVEL OPERATION USING THE TACWAR (TACTICAL WARFARE) MODEL. THE REPORT DESCRIBES THE INPUT DATA ON: GROUND FORCES; TACTICAL AIR AND AIR DEFENSE; NUCLEAR AND CHEMICAL DATA; TARGET ACQUISITION; SUPPLIES; AND THEATER LEVEL STRUCTURE. INCLUDED ON THE APPENDICES IS INFORMATION ON THE SOURCES OF DATA AND ESTIMATIONS OF QUALITY; COMPUTER LISTING OF INPUT DATA; AND SELECTED RESULTS AND SUMMARY OF OUTPUT.

DDC: ADC023184

TITLE: SOME TECHNIQUES TO HELP IMPROVE METHODS FOR EXERCISING AND EVALUATING COMMAND AND CONTROL SYSTEMS, ESD-TDR-64-195

AUTHOR: P. KUGEL, M.F. OWENS

ORIGINATING ORG: TECHNICAL OPERATIONS RESEARCH, BURLINGTON, MA FOR AIR FORCE SYSTEMS COMMAND, BEDFORD, MA 1

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 64/01/31

COMMENTS: THIS REPORT DESCRIBES THE DEVELOPMENT OF FOUR MODELS OF COMMAND AND CONTROL SYSTEMS. THESE MODELS ARE INTENDED TO IMPROVE METHODS FOR DESIGNING AND EVALUATING COMMAND AND CONTROL SYSTEMS AND TO STANDARDIZE TECHNOLOGY AND IMPROVE COMMUNICATION. THE MODELS ARE: EXERCISE FLOW DIAGRAM, WHICH EXTENDS COMPUTER FLOW-CHARTING TO MODEL AN EXERCISE; RESOURCE ASSIGNMENT MODEL, WHICH RELATES PROBLEMS TO THEIR SOLUTIONS; EXPECTED UTILITY MODEL, WHICH DESCRIBES DECISION-MAKING PROCESSES; AND FINITE AUTOMATION MODEL, WHICH DESCRIBES THE RELATIONSHIP BETWEEN THE COMMAND AND CONTROL SYSTEM AND ITS ENVIRONMENT. THE FIRST THREE MODELS ARE DETAILED IN THE APPENDICES. THE MODELS PRESENTED IN THIS DOCUMENT MAY BE VALUABLE FOR OTHER APPLICATIONS.

DDC: AD433162

TITLE: EVALUATION OF IMPERMEABLE PROTECTIVE GARMENTS USING HEAT TRANSFER MODELS

AUTHOR: Y.G. KWON, J.D. RAMSEY

ORIGINATING ORG: TEXAS TECH UNIVERSITY, LUBBOCK, TX

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 86/10/01  
COMMENTS: THIS ARTICLE PRESENTS A COMPARISON STUDY OF THREE HEAT TRANSFER MODELS. THESE THREE METHODS ARE: GAGGE/NISHI MODEL; GOLDMAN MODEL; AND INTERNATIONAL STANDARDS ORGANIZATION (ISO) MODEL. A COMPUTER SIMULATION WAS DEVELOPED TO ASCERTAIN THE DIFFERENCE BETWEEN THE METHODS. EQUATIONS FOR EACH OF THE HEAT TRANSFER MODELS ARE PROVIDED. TABLES FOR A COMPARISON OF THE THREE MODELS FOR HEAT STORAGE, EVAPORATION AND AIR TEMPERATURE FOR REGULAR CLOTHING AND IMPERMEABLE CLOTHING ARE PRESENTED.

SOURCE: PROCEEDINGS OF THE HUMAN FACTORS SOCIETY - 30TH ANNUAL MEETING, 1986

BIBLIOGRAPHY CITE: KWON, Y.G., AND RAMSEY, J.D., EVALUATION OF IMPERMEABLE PROTECTIVE GARMENTS USING HEAT TRANSFER MODELS, TEXAS TECH UNIVERSITY, LUBBOCK, TX, OCTOBER 1986

TITLE: MONTHLY MEAN EVAPORATION AND SURFACE WINDS OVER THE NORTHERN HEMISPHERE OCEANS AND THEIR YEAR-TO-YEAR VARIATIONS, TP-7-75

AUTHOR: S. LARSON, T. LAEVASTU  
ORIGINATING ORG: NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 75/03/01  
COMMENTS: DEALS WITH A MATHEMATICAL MODEL OF SEA SURFACE EVAPORATION AS A FUNCTION OF SEA-SURFACE TEMPERATURES. CONTAINS A BRIEF DESCRIPTION OF MICROMETEOROLOGICAL CHARACTERISTICS OF THE ATMOSPHERE OVER THE OCEAN AND A FORMULA FOR PREDICTING SURFACE WINDS AS A FUNCTION OF LATITUDE AND GEOSTROPHIC WIND.

DDC: ADA010792  
SOURCE: DTIC

TITLE: EVALUATING THE EFFECTIVENESS OF MILITARY DECISION SUPPORT SYSTEMS: THEORETICAL FOUNDATIONS, EXPERT SYSTEM DESIGN, AND EXPERIMENTAL PLAN

AUTHOR: A. LEAL  
ORIGINATING ORG: INTEGRATED SCIENCES CORPORATION, MONICA, CA FOR US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ARI-RN-83-18

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 82/09/01  
COMMENTS: THIS DOCUMENT DISCUSSES A MODEL FOR EVALUATING THE EFFECTIVENESS OF COMPUTER BASED EXPERT SYSTEMS IN

MILITARY TRAINING AND PLANNING ENVIRONMENTS. THE THEORETICAL FOUNDATION FOR THE MODEL AND A SAMPLE EXPERT SYSTEM ARE PRESENTED. AN EXPERIMENTAL DESIGN TO TEST THE EFFECTIVENESS OF THE SAMPLE EXPERT SYSTEM IS GIVEN.

DDC: ADA133080

TITLE:  
AUTHOR:  
ORIGINATING ORG:  
CLASSIFICATION:  
DOCUMENT DATE:  
COMMENTS:

TACWAR INPUTS/OUTPUTS VOLUME I - INPUTS  
W. LEONARD  
COMPUTER SCIENCES CORP., ARLINGTON, VA.  
UNCLASSIFIED/LIMITED

80/02/15

THE INSTITUTE FOR DEFENSE ANALYSES TACTICAL WARFARE (TACWAR) MODEL IS A FULLY AUTOMATED COMBAT SIMULATION THAT CAN BE USED TO ASSESS THE INTERACTION OF COMBAT FORCES EMPLOYING CONVENTIONAL, NUCLEAR, AND CHEMICAL WEAPONS IN A THEATER-WIDE CAMPAIGN. VOLUME I OF THIS TECHNICAL MEMORANDUM PROVIDES A GENERAL DESCRIPTION OF THE HONEYWELL INFORMATION SYSTEMS (HIS) 6080 VERSION OF THE TACWAR MODEL AND A DETAILED DESCRIPTION OF THE INPUT REQUIREMENTS. INFORMATION REQUIRED TO PREPARE INPUT DATA AND JOB CONTROL CARDS NECESSARY TO EXECUTE TACWAR ARE ALSO PRESENTED. OUTPUT REPORTS, INCLUDING THE INTERFACE WITH THE GRAPHIC INFORMATION PRESENTATION SYSTEMS (GIPSY), AND THE USE OF GIPSY IN POSTPROCESSING ANALYSIS OF TACWAR OUTPUT, ARE DESCRIBED IN VOLUME II.

DDC: ADB045470

TITLE:  
AUTHOR:  
ORIGINATING ORG:  
CLASSIFICATION:  
DOCUMENT DATE:  
COMMENTS:

TACWAR INPUTS/OUTPUTS VOLUME II - OUTPUTS  
W. LEONARD  
COMPUTER SCIENCES CORP. , ARLINGTON, VA.  
UNCLASSIFIED/LIMITED

/02/15

THE INSTITUTE FOR DEFENSE ANALYSES TACTICAL WARFARE (TACWAR) MODEL IS A FULLY AUTOMATED COMBAT SIMULATION THAT CAN BE USED TO ASSESS THE INTERACTION OF COMBAT FORCES EMPLOYING CONVENTIONAL, NUCLEAR AND CHEMICAL WEAPONS IN A THEATER-WIDE CAMPAIGN. VOLUME I OF THIS TECHNICAL MEMORANDUM PROVIDES A GENERAL DESCRIPTION OF THE HONEYWELL INFORMATION SYSTEMS (HIS) 6080 VERSION OF THE TACWAR MODEL AND A DETAILED DESCRIPTION OF THE INPUT REQUIREMENTS. INFORMATION REQUIRED TO PREPARE INPUT DATA AND JOB CONTROL CARDS NECESSARY TO EXECUTE TACWAR ARE ALSO PRESENTED. OUTPUT REPORTS, INCLUDING THE INTERFACE WITH THE GRAPHIC INFORMATION PRESENTATION SYSTEMS (GIPSY), AND THE USE OF GIPSY IN POSTPROCESSING ANALYSIS OF TACWAR OUTPUT, ARE DESCRIBED IN VOLUME II.

DDC: ADB045471

TITLE: SOVIET SORTIE GENERATION CAPABILITIES AND  
VULNERABILITIES, R-3118-AF  
AUTHOR: D.E. LEWIS, R.M. PAULSON, C.B. EAST, H.G. MASSEY,  
J.T. QUINLIVAN, J.C. WENDT  
ORIGINATING ORG: RAND, SANTA MONICA, CA FOR HQ USAF/INE, WASHINGTON DC  
CLASSIFICATION: SECRET  
DOCUMENT DATE: 85/08/01  
COMMENTS:

THE OBJECTIVES OF THIS STUDY WERE TO ESTIMATE THE SORTIE CAPABILITIES OF SOVIET FIGHTER-BOMBER REGIMENTS, TO ASSESS THE POTENTIAL VULNERABILITIES OF THOSE REGIMENTS, AND TO DETERMINE HOW THOSE VULNERABILITIES COULD BEST BE EXPLOITED BY AN OFFENSIVE COUNTERAIR (OCA) CAMPAIGN. TO DETERMINE THE SORTIE GENERATION POTENTIAL, THEY USED TSAR MODEL. MANY CLASSIFIED RESULTS OF TSAR MODEL WERE GIVEN.

TITLE: A VISUAL PERFORMANCE MODEL FOR AIDED AND UNAIDED VISION, USERS GUIDE, NWSC/CR/RDTR-146  
AUTHOR: C. LOHKAMP, R. CHIPMAN, N. PAPKE  
ORIGINATING ORG: NAVAL WEAPONS SUPPORT CENTER, APPLIED SCIENCES DEPARTMENT, CRANE, IN  
CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 81/09/01  
COMMENTS: PRESENTED IS A MODEL WHICH PREDICTS VISUAL PERFORMANCE FOR BOTH DAYLIGHT AND NIGHT TIME. VISION CAN BE AIDED OR UNAIDED.

TITLE: ANALYSIS OF DECONTAMINATION VERSUS NATURAL WEATHERING OF CHEMICALLY CONTAMINATED U.S. NAVY SHIPS DURING MILITARY OPERATIONS AT SEA, NSWC-TR-84-105  
AUTHOR: R.G. MAGEE, J.C. O'NEAL, T.J. YENCHA  
ORIGINATING ORG: NAVAL SURFACE WEAPONS CENTER, DAHLGREN, VA  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 84/11/01  
COMMENTS: THIS REPORT EVALUATED THE EFFECTIVENESS ON THE RELIABILITY OF NATURAL WEATHERING VERSUS THE TERMINATION AND COMPLETION OF FULL SCALE MECHANICAL DECONTAMINATION PROCEDURES ON CHEMICALLY CONTAMINATED US NAVY SHIPS. THE CRITERIA FOR THE DECONTAMINATION PROCESSES ARE CONTAINED IN THIS REPORT. FIVE SHIP CLASSES, THREE AGENTS (MUSTARD (HD), SOMAN (GD), AND THICKENED SOMAN (TGD)), WORST CASES, THREE TEMPERATURES (15, 25, 34 DEGRESS CELCIUS), AND THREE WINDSPEEDS (6, 15, 25 KNOTS) WERE USED AS PARAMETERS IN THE COMPARISON. REPORT CONTAINS A BRIEF DESCRIPTION OF THE DEPOSITION/EVAPORATION MODEL DEPOSITION AND WEATHERING IN A NAVY ENVIRONMENT (DAWN). MODEL PARAMETERS (AGENT, TEMPERATURE, WINDSPEED, SPREAD FACTOR, CLOUD SIZE) ARE GIVEN. DECONTAMINATION TIMELINES ARE ALSO GIVEN.

DDC: ADB094394

TITLE: AN ARCHITECTURAL REFERENCE MODEL FOR DISTRIBUTED BMS/FILE SYSTEM ENVIRONMENTS, TR-80-010

AUTHOR: P.S. MAGER, R.P. GOLDBERG

ORIGINATING ORG: BGS SYSTEMS, INCORPORATED, WALTHAM, MA FOR NUSC - NEW LONDON LABORATORY, NEW LONDON, CT

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 80/09/01

COMMENTS: REPORT PRESENTS A MODEL FOR DISTRIBUTED DATA BASE FILE SYSTEMS. DISTRIBUTED DATA BASE FILE SYSTEMS ARE A NEW CONCEPT THAT ALLOW THE DATA BASE TO DISTRIBUTE AMONG SEVERAL LOCATIONS INSTEAD OF ONE. THE REPORT USES THE CLIENT-SERVER CONCEPT TO DEVELOP LAYERED PROTOCOLS FOR SUCH SYSTEMS AND GIVES AN OVERVIEW OF THE FUNCTIONABILITY REQUIRED.

DDC: ADA126025

TITLE: RAPID RUNWAY REPAIR TASK DEGRADATION STUDY (RAPID RUNWAY REPAIR CAPABILITY), ESL-TR-83-06

AUTHOR: T.J. MASCARELLA

ORIGINATING ORG: QUEST RESEARCH CORPORATION, DAYTON, OH FOR AIR FORCE ENGINEERING AND SERVICES CENTER, TYNDALL AFB, FL

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 83/05/01

COMMENTS: DOCUMENT CONTAINS RESULTS OF RAPID RUNWAY REPAIR (RRR) STUDY USING SIMULATION MODEL. ANALYSIS MADE MAKING COMPARISON OF PROTECTION IN A CHEMICALLY CONTAMINATED ENVIRONMENT. TASK TIME DEGRADATION WAS EXAMINED FOR THERMAL EFFECTS ONLY. RESULTS SHOWN ARE DERIVED FROM ESTIMATED DATA. GOOD FOR GENERAL DESCRIPTION OF RRR METHODOLOGY.

TITLE: COMPUTERIZED BIOMECHANICAL MAN-MODEL, AMRL-TR-76-30

AUTHOR: J.W. McDANIEL

ORIGINATING ORG: U.S. AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY(AFAMRL), WRIGHT-PATTERSON AFB, OH

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 76/07/01

COMMENTS: THIS DOCUMENT DESCRIBES THE CAPABILITIES AND POTENTIAL USES OF THE COMBIMAN COMPUTER MODEL AVAILABLE TO AFAMRL. THE PROCESS OF CONSTRUCTING THE MAN MODEL IS DIS

DDC: ADA032402

TITLE: A COMPUTER MODELING PROGRAM FOR ESTIMATION OF PERFORMANCE DEGRADATION FROM SUBLETHAL EFFECTS OF CHEMICAL AGENTS, CRDC-TR-84053

AUTHOR: R.F. MCHUGH, R.J. MIODUSZEWSKI, A.P. MICKIEWICZ, J.H. THOMPSON, J.W. JAMESON, P.A. BROOME, E.G. DAVIS  
ORIGINATING ORG: CHEMICAL RESEARCH AND DEVELOPMENT CENTER (CRDC), ABERDEEN PROVING GROUND, MD  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 85/02/01  
COMMENTS: THIS REPORT CONCERNS A COMPUTER MODEL DEVELOPED FOR ESTIMATING THE EFFECT OF CHEMICAL AGENT-INDUCED SYMPTOMS ON THE PERFORMANCE OF SPECIFIED MILITARY TASKS AND THE EFFECTS OF CUMULATIVE SYMPTOMS ON MISSION DEGRADATION. THE DATA USED TO DEVELOP AND TEST THE MODEL ARE ESTIMATES OF HUMAN RESPONSES TO VX AND GB, (SARIN) BY THE INHALATION AND INTRAMUSCULAR ROUTES OF EXPOSURE. INCLUDED IS SAMPLE COMPUTER MODEL OUTPUT.

DDC: ADB090870

TITLE: A COMPUTER PROGRAM FOR THE CALCULATION OF LIQUID OR VAPOUR PENETRATION THROUGH BARE AND CLOTHED SKIN  
DRES-TN-310  
AUTHOR: W.R. MCPHERSON  
ORIGINATING ORG: DEFENCE RESEARCH ESTABLISHMENT SUFFIELD(DRES), CANADA  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 72/04/01  
COMMENTS: THE PENETRATION MODEL WAS DEVELOPED IN ORDER TO BETTER UNDERSTAND THE HAZARDS POSED BY TOXIC CHEMICALS, EITHER IN THE LIQUID OR VAPOR PHASE, TO HUMANS. STUDY DEALT WITH AN ATTEMPT TO DESCRIBE MATHEMATICALLY THE PHYSICAL PROCESSES OCCURRING, WITH TIME, WHEN LIQUID DROPLETS IMPACT ON CLOTHING OR BARE SKIN; OR WHEN A PERSON EITHER FULLY CLOTHED OR HAVING BARE SKIN IS EXPOSED TO TOXIC CHEMICAL VAPORS.

DDC: AD894559

TITLE: FINAL REPORT ON COMPUTER MODELING OF CHEMICAL WARFARE EFFECTS  
AUTHOR: R.S. NEWELL, A.H. SAMUEL  
ORIGINATING ORG: BATTELLE-COLUMBUS LABORATORIES, COLUMBUS, OH, FOR US AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY (AFAMRL), WRIGHT-PATTERSON AFB, OH  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 78/10/26  
COMMENTS: THIS DOCUMENT REPORTS THE FINDINGS FROM AN INVESTIGATION OF WAYS TO MODEL THE IMPACT OF SUBLETHAL CHEMICAL WARFARE DOSING OF HUMANS ON AIR FORCE EFFECTIVENESS. CRITICAL TASKS ARE IDENTIFIED AND MODELS ARE SELECTED WITH APPROPRIATE MODIFICATIONS

TITLE: CW MATHEMATICAL RESEARCH SIXTH QUARTERLY PROGRESS REPORT, PROGRESS REPORT 526.19

AUTHOR: M.L. NORDEN

ORIGINATING ORG: NEW YORK UNIVERSITY, UNIVERSITY HEIGHTS, NY FOR CHEMICAL CORPS RESEARCH AND DEVELOPMENT LABORATORIES, ARMY MEDICAL CENTER, MD

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 61/11/15

COMMENTS: A MODEL TO ESTIMATE THE NUMBER OF CASUALTIES IS DERIVED. THE MODEL IS IN TERMS OF THE POSITION OF THE MEN AND THE CASUALTIES AT A GIVEN LOCATION IF THERE IS A MAN PRESENT. AN EXAMPLE IS GIVEN WITH MEN POSITIONED IN A LINE AT FIXED DISTANCE APART.

DDC: AD267460

TITLE: NUCLEAR FIRE PLANNING AND ASSESSMENT MODEL III (NUFAM III) USER'S MANUAL, CAA-D-82-3

AUTHOR: A.W. PAARMANN, J.M. DELOACH

ORIGINATING ORG: US ARMY CONCEPTS ANALYSIS AGENCY, BETHESDA, MD

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 82/11/01

COMMENTS: THIS USER'S MANUAL PROVIDES A SUMMARY OF THE PURPOSES AND USES FOR THE NUCLEAR FIRE PLANNING AND ASSESSMENT MODEL III (NUFAM III); AND THE LINKAGE PROGRAM (LNP), WHICH LINKS NUFAM III WITH THE COMBAT SAMPLE GENERATOR (COSAGE) MODEL. NUFAM III IS A TWO-SIDED STOCHASTIC MODEL THAT EXAMINES NUCLEAR AND CHEMICAL FIRE PLANNING AND DAMAGE ASSESSMENT AT THE CORPS LEVEL.

DDC: ADA142883

SOURCE: DTIC

BIBLIOGRAPHY CITE: PAARMANN, A.W. AND DELOACH, J.M., NUCLEAR FIRE PLANNING AND ASSESSMENT MODEL III (NUFAM III) USER'S MANUAL, CAA-D-82-3, US ARMY CONCEPTS ANALYSIS AGENCY, BETHESDA, MD, NOVEMBER 1982

TITLE: PREDICTION MODELING OF PHYSIOLOGICAL RESPONSES AND HUMAN PERFORMANCE IN THE HEAT, USARIEM-M-1/86

AUTHOR: K.B. PANDOLF, L.A. STROSCHEN, L.L. DROLET, R.R. GONZALEZ, M.N. SAWKA

ORIGINATING ORG: US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE (USARIEM), NATICK, MA

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 85/09/01

COMMENTS: THIS DOCUMENT DISCUSSED THE PREDICTIVE IMPORTANCE OF PHYSICAL FITNESS AND STATE OF HYDRATION. AN HP41CV CALCULATOR WAS PROGRAMMED WITH EQUATIONS USED TO DEVELOP A HEAT STRESS MODEL FOR PREDICTING SOLDIER PERFORMANCE TO WORK, CLOTHING, AND ENVIRONMENT. THE INPUTS FOR THE EQUATIONS ARE BODY TEMPERATURE AND

SWEAT LOSS WHICH WILL PRODUCE THE FOLLOWING OUTPUTS: EXPECTED PHYSICAL WORK/REST CYCLE, MAXIMUM SINGLE WORK TIME, AND ASSOCIATED WATER REQUIREMENTS. THE PREDICTED TEMPERATURE PATTERNS WERE DISCOVERED TO BE IN GOOD AGREEMENT WITH EXPERIMENTAL OBSERVATIONS.

DDC: ADA160513

SOURCE: DTIC

BIBLIOGRAPHY CITE: PANDOLF, K.B., STROSCHEIN, L.A., DROLET, L.L., GONZALEZ, R.R. AND SAWKA, M.N., PREDICTION MODELING OF PHYSIOLOGICAL RESPONSES AND HUMAN PERFORMANCE IN THE HEAT, USARIEM-M-1/86, US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE (USARIEM), NATICK, MA, SEPTEMBER 1985

TITLE: CACDA JIFFY III WAR GAME, VOLUME IV, USER'S MANUAL

AUTHOR: C.L. PAO, R.J. SCHWABAUER

ORIGINATING ORG: US COMBINED ARM STUDIES AND ANALYSIS ACTIVITY, FORT LEAVENWORTH, KS

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 80/10/01

COMMENTS: THIS REPORT IS ONE OF FIVE VOLUMES PRODUCED TO DOCUMENT THE COMBAT ASSESSMENT METHODOLOGIES AND AUTOMATED FEATURES OF THE COMBINED ARMS COMBAT DEVELOPMENT ACTIVITY (CACDA) JIFFY III WAR GAMING PROCESS, DEVELOPED TO SUPPORT TRADOC SCORES SCENARIO DEVELOPMENT. THIS VOLUME PROVIDES THE MODEL USER'S MANUAL.

DDC: ADA091291

TITLE: THE SIMPLEST MODEL FOR THE VAPOR TRANSFER OF LIQUIDS FROM HOLES, SLITS, PORES AND CRACKS, ARCSL-TR-80009

AUTHOR: E.C. PENSKI, H.M. WALKER

ORIGINATING ORG: CHEMICAL SYSTEMS LABORATORY(CSL), ABERDEEN PROVING GROUND, MD

CLASSIFICATION: UNCLASSIFIED/LIMITED

DOCUMENT DATE: 80/07/01

COMMENTS: A MATHEMATICAL MODEL FOR THE VAPOR TRANSFER OF LIQUIDS FROM HOLES, SLITS, PORES, AND CRACKS IS DEVELOPED AND TESTED FOR A FEW EXPERIMENTAL CASES. POTENTIAL APPLICATIONS OF THE MODEL ARE DISCUSSED.

DDC: ADB050292

TITLE: ANALYSIS OF CHEMICAL WARFARE THREAT HAZARD TO USAF IN EUROPE, AFAMRL-TR-83-0011

AUTHOR: C.D. PORTER, G.M. CACIOPPO, W.P. JANSON, C.R.

REPLOGLE, R.E. YATES

ORIGINATING ORG: AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY (AFAMRL), WRIGHT-PATTERSON AFB OH; CONTRACTOR: MCCUALEY-BROWN, INC., FAIRBORN, OH

CLASSIFICATION: SECRET  
DOCUMENT DATE: 83/01/01  
COMMENTS: THIS REPORT OF ANALYSIS IS AN INTEGRATED ASSESSMENT OF THE EFFECTS OF CHEMICAL WARFARE UPON A CENTRAL EUROPEAN AIRFIELD. A GOAL CENTERED ATTACK WAS USED TO SELECT THE THREAT WEAPONS TO BE EMPLOYED AGAINST AN AIR BASE. THE NON-UNIFORM SIMPLE SURFACE EVAPORATION (NUSSE) MODEL WAS USED TO DETERMINE THE CONCENTRATIONS OF NERVE AND BLISTER AGENT UPON THE AIRFIELD. THE MONOGHAN SURFACE EVAPORATION (SURFEVAP) MODEL AND CHINN'S SIMPLIFIED METHODOLOGY WERE COMPARED IN THE PREDICTION OF THE TIME HISTORY OF VAPOR CONCENTRATIONS ON THE AIRFIELD. THE TIME POSTURES ARE SHOWN FOR THE FIFTIETH AND NINETIETH PERCENTILE OF CONTAMINATION. THE STATUS OF DETECTION AND DECONTAMINATION AS WELL AS MEDICAL EFFECTS ARE REVIEWED.

DDC: ADC033077  
SOURCE: DTIC  
BIBLIOGRAPHY CITE: PORTER, C.D., ET AL., ANALYSIS OF CHEMICAL WARFARE THREAT HAZARD TO USAF IN EUROPE, AFAMRL-TR-83-0011, US AIR FORCE MEDICAL RESEARCH LABORATORY (AFAMRL), WRIGHT-PATTERSON AIR FORCE BASE, OH, JANUARY 1983

TITLE: CATALOG OF WARGAMING AND MILITARY SIMULATION MODELS, 9TH EDITION  
AUTHOR: A.F. QUATTROMANI  
ORIGINATING ORG: ORGANIZATION OF THE JOINT CHIEFS OF STAFF, STUDIES, ANALYSIS, AND GAMING AGENCY, WASHINGTON, DC  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 82/05/01  
COMMENTS: THIS NINTH EDITION LISTS THE DESCRIPTIONS OF 363 SIMULATIONS, WAR GAMES, GAMES, EXERCISES, AND MODELS. THESE ARE INDEXED BY TITLE (AND ACRONYM) AND BY CATEGORIZATION OF TYPE AND APPLICATION. THE MODEL DESCRIPTIONS INCLUDE PROONENT, DEVELOPER, PURPOSE, GENERAL DESCRIPTION, INPUT, OUTPUT, LIMITATIONS, HARDWARE, SOFTWARE, TIME REQUIREMENTS, SECURITY CLASSIFICATION, FREQUENCY OF USE, AND POINT OF CONTACT FOR ADDITIONAL INFORMATION.

DDC: ADA115950

TITLE: THE VOLUME SOURCE DIFFUSION MODEL (VSDM) COMPUTER PROGRAM FOR ESTIMATING CHEMICAL AGENT DISPERSION, TR-83-335-01  
AUTHOR: J.E. RAFFERTY, R.K. DUMBAULD  
ORIGINATING ORG: H.E. CRAMER COMPANY, SALT LAKE CITY, UT, AND SYSTEM DEVELOPMENT CORPORATION, MCLEAN, VA FOR US AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY (AMRL), WRIGHT-PATTERSON AFB, OH  
CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 83/06/01  
COMMENTS: SURFACE METEOROLOGICAL DATA FROM 1963 TO 1967 WAS ANALYZED FROM BITBURG, SPANGDAHLEM, HAHN, YAKOTA, AND OSAN-NI AIRFIELDS. THIS PROVIDED INFORMATION ON AVERAGE WINDSPEED, WIND DIRECTION, AND TEMPERATURE BY PASQUILL STABILITY CATEGORY FOR MONTHLY, SEASONAL, AND ANNUAL TIME PERIODS. THIS DATA WAS USED TO SELECT PARAMETERS TO BE USED IN SAMPLE CALCULATIONS WITH THE VOLUME SOURCE DIFFUSION MODEL. BULK FILLED NON-PERSISTENT AGENT FILLED BOMBS AND SUB-MUNITIONS WERE USED TO IDENTIFY SOURCE PARAMETERS TO BE USED IN CONJUNCTION WITH THIS MODEL. SAMPLE RESULTS WERE INCLUDED WHICH SHOW THE DOSAGE AS A FUNCTION OF DOWNWIND DISTANCE.

TITLE: ANALYTICAL EVALUATION OF CURRENT UNITED STATES ARMY GUIDELINES FOR SOLDIERS WEARING NBC PROTECTIVE OVERGARMENTS UNDER VARIOUS ENVIRONMENTAL CONDITIONS

AUTHOR: L.T. RICH  
ORIGINATING ORG: ARMY MILITARY PERSONNEL CENTER, ALEXANDRIA, VA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 85/04/26  
COMMENTS: THIS THESIS REPORT EVALUATES THE CURRENT US ARMY CHEMICAL OVERGARMENT IN THE MOPP-4 CONFIGURATION UNDER VARIOUS ENVIRONMENTAL CONDITIONS. THE EFFECT OF HUMIDITY, TEMPERATURE, RADIANT HEAT LOAD, AND WIND VELOCITY ON EVALUATING THERMAL STRESS. THIS REPORT PRESENTS THAT WATER LOSS CORRESPONDING TO 10 PERCENT DEHYDRATION OF THE BODY DEMANDS WATER REPLACEMENT IN A SHORT TIME, THE ONSET OF WATER DEPLETION HEAT EXHAUSTION. AT TEMPERATURES ABOVE 27 DEGREES CELCIUS, THEN CONSUME ONE QUART OF WATER EVERY TWO HOURS. FORMULAS ARE PRESENTED FOR THERMAL ENERGY BALANCE, WATER LOSS THROUGH SWEATING, AND DATA FROM WISSLER'S MODEL.

DDC: ADA154509

TITLE: NAMES III USER'S MANUAL (INCLUDING EXECUTIVE SUMMARY)  
AUTHOR: PAUL B. RICHARDS, DOUGLAS T. FOX, BARRY H. ROSENBERG,  
MICHAEL M. SEBRING,, WILLIAMS A. BURDETTE  
ORIGINATING ORG: NAVAL RESEARCH LAB., WASHINGTON D.C.  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 79/05/01  
COMMENTS: THE NAVAL RESEARCH LABORATORY NAMES III (NAVY AMPHIBIOUS MEDICAL EVACUATION SIMULATION) MODEL IS A COMPUTER PROGRAM WHICH SIMULATES THE OPERATION OF MULTI-ECHELON MEDICAL TREATMENT AND EVACUATION SYSTEMS. NAMES III TRACKS THE FLOW OF EACH COMBAT CASUALTY FROM THE FORWARD EDGE OF THE BATTLE AREA (FEBA) THROUGH THE COMBAT ZONE, THROUGH THEC

OMMUNICATIONS ZONE (COMMZ) AND INTO THE  
CONTINENTAL UNITED STATES (CONUS). NAMES III IS A  
CAPABILITIES MODEL, DESIGNED TO ASSIST THE ARMED  
FORCES IN THE DEVELOPMENT OF WARTIME MEDICAL SUPPORT  
PLANNING AND PATIENT MANAGEMENT. USER INPUTS FOR NAMES  
III INCLUDE THE PATIENT WORK LOAD, MEDICAL PERSONNEL  
AND MATERIAL RESOURCES, EVACUATION RESOURCES INCLUDING  
AMBULANCES, HELICOPTERS, AND FIXED-WING AIRCRAFT, AS  
WELL AS THE CONFIGURATION OF THE COMPLETE MEDICAL  
TREATMENT AND EVACUATION SYSTEM. OUTPUTS OF NAMES III  
INCLUDE PATIENT DISPOSITIONS, INCLUDING MORTALITIES,  
MEASURES OF MORBIDITY, AND THE NUMBER OF PATIENTS  
RETURNED TO DUTY. MEASURES OF RESOURCE UTILIZATION,  
SHORTCOMINGS AND EFFICIENCY ARE ALSO OBTAINED AS  
OUTPUT FROM THE MODEL.

TITLE: TSAR DATABASE DICTIONARY - A-10 WITH INTERMEDIATE  
MAINTENANCE  
AUTHOR: D. ROBINSON, C. GORNTO  
ORIGINATING ORG: ORLANDO TECHNOLOGY, INC., SHALIMAR, FL FOR THE  
PENTAGON, WASHINGTON, DC  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 86/04/26  
COMMENTS: DOCUMENTS THE A-10 INPUT DATABASE FOR THE THEATER  
SIMULATION OF AIR BASE RESOURCES (TSAR) MODEL.  
INCLUDES TSAR CONTROL VARIABLES, RESOURCE  
REQUIREMENTS, TASK NETWORKS, INITIAL STOCKS AND STATUS  
OF AIR BASE RESOURCES, COMMUNICATION SYSTEM DATA, AND  
CROSS REFERENCES FOR TASKS, PERSONNEL AEROSPACE GROUND  
EQUIPMENT (AGE), AND PART NUMBERS.

TITLE: AN ANALYSIS OF HUMAN THERMAL RESPONSE TO A STEP CHANGE  
IN ENVIRONMENTAL CONDITIONS, 72-WA/BHF-8  
AUTHOR: R.B. ROEMER, S.M. HORVATH  
ORIGINATING ORG: AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME),  
UNITED ENGINEERING CENTER, NEW YORK, NY  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 72/07/28  
COMMENTS: AN ANALYTICAL SOLUTION HAS BEEN DEVELOPED TO PREDICT  
THE TEMPERATURE DISTRIBUTION WITHIN THE HUMAN BODY FOR  
THE CONDITION OF A STEP CHANGE IN THE THERMAL  
ENVIRONMENT. THE TRENDS PREDICTED BY THE MODEL COMPARE  
CLOSELY TO THE EXPERIMENTAL RESULTS FROM A PREVIOUS  
STUDY. BOTH THE MODEL AND THE EXPERIMENTS SHOW THAT  
PREDICTIONS OF THE RATE OF CHANGE OF BODY ENERGY  
CONTENT AND ENERGY DEBT, AS CALCULATED FROM RESULTS  
BASED ON THE STANDARD EQUATION: (MEAN BODY TEMPERATURE  
= ONE THIRD MEAN SKIN TEMPERATURE PLUS TWO THIRDS  
RECTAL TEMPERATURE) ARE SUBJECT TO LARGE ERRORS, AND  
THAT THE CORRECT WEIGHTING FACTORS FOR SKIN AND CORE

TEMPERATURE ARE A FUNCTION OF TIME AND ENVIRONMENTAL CONDITIONS. THE INFORMATION OBTAINED FROM THE ANALYSIS WILL BE USEFUL IN DETERMINING THE MAGNITUDE OF THE THERMAL STRESSES ON INDIVIDUALS IN TRANSIENT THERMAL ENVIRONMENTS.

TITLE: ANALYSIS OF MILITARY ORGANIZATIONAL EFFECTIVENESS (AMORE) USER'S HANDBOOK  
AUTHOR: G. ROSS, R. ROBINSON  
ORIGINATING ORG: TRADOC SYSTEMS ANALYSIS ACTIVITY, WHITE SANDS MISSILE RANGE, NM  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 82/12/01  
COMMENTS: THIS HANDBOOK PROVIDES AMORE USERS WITH INFORMATION ON THE FUNDAMENTAL CONCEPTS, SOFTWARE, OPERATIONAL PROCEDURES, AND EXAMPLES OF AMORE MODEL METHODOLOGY APPLICATIONS. THIS METHODOLOGY WAS DEVELOPED AS A MEANS TO EXAMINE THE ABILITY OF MILITARY UNITS TO RECONSTITUTE CAPABILITY AFTER EXPERIENCING DEGRADATION OF PERSONNEL AND/OR MATERIEL. DISCUSSES THE MODEL, INPUT/OUTPUT AND CARD FORMATS.  
DDC: ADA128045

TITLE: SYSTEMS STUDY IN SUPPORT OF EXPLORATORY DEVELOPMENT OF THE REMOTE NBC DETECTION SYSTEM - FINAL REPORT VOLUME 2, USERS MANUAL, CRDC-CR-84066  
AUTHOR: K. ROTH, R. WINKLER  
ORIGINATING ORG: AMAF INDUSTRIES INCORPORATED, COLUMBIA, MD FOR CHEMICAL RESEARCH AND DEVELOPMENT CENTER (CRDC), ABERDEEN PROVING GROUND, MD  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 84/06/01  
COMMENTS: THIS VOLUME PROVIDES OPERATING INSTRUCTIONS FOR RUNNING THE DETECTION SYSTEM PERFORMANCE MODEL. THIS MODEL INCORPORATES SEVERAL COMPUTER MODELS: EOSAEL 82 WHICH DEFINES CLIMATE CONDITIONS, NUSSE 2 WHICH IS USED FOR DETECTION AND CASUALTY ASSESSMENT, PRETOX WHICH PREPARES NUSSE 2 OUTPUT FOR USE IN AURA, AND AURA WHICH ASSESSES CASUALTIES AND EVALUATES THE EFFECTIVENESS OF A MILITARY UNIT. THIS VOLUME DOES NOT DISCUSS MODEL LOGIC OR METHODOLOGY; IT DOES, HOWEVER, PROVIDE SAMPLE INPUT AND OUTPUT FOR EACH OF THE MODELS.  
DDC: ADB088615  
SOURCE: DTIC

TITLE: THE EFFECT OF STIMULUS-CENTRAL PROCESSING-RESPONSE COMPATIBILITY AND RESOURCE COMPETITION ON PILOT PERFORMANCE, EPL-82-1/ONR-82-1

AUTHOR: D. SANDRY, C.D. WICKENS  
ORIGINATING ORG: UNIVERSITY OF ILLINOIS, CHAMPAIGN, IL FOR OFFICE OF  
CLASSIFICATION: NAVAL RESEARCH (ONR), ARLINGTON, VA  
DOCUMENT DATE: UNCLASSIFIED  
COMMENTS: 82/04/01  
THE PROCESS OF STIMULUS-CENTRAL PROCESSING-RESPONSE (S-C-R) COMPATIBILITY IS DESCRIBED AS A PRINCIPLE BY WHICH A TASK WITH VERBAL CENTRAL-PROCESSING COMPONENTS IS BEST SERVED BY AUDITORY INPUT AND SPEECH RESPONSE, WHILE A TASK WITH SPATIAL PROCESSING COMPONENTS IS BEST SERVED BY VISUAL INPUT AND MANUAL RESPONSE. A MODEL IS PROPOSED THAT PREDICTS THE JOINT EFFECTS OF S-C-R COMPATIBILITY AND RESOURCE COMPETITION WHEN A SPATIAL AND VERBAL TASK EACH PAIRED WITH ALL FOUR INPUT/OUTPUT MODALITY COMBINATIONS, IS TIME SHARED WITH A VISUALLY DISPLAYED MANUAL CONTROL TASK. THIS MODEL WAS TESTED IN AN F-18 SIMULATOR. THE RESULTS OF THE STUDY SUGGEST THAT VERBAL TASKS, RATHER THAN SPATIAL TASKS WILL BE MOST BENEFITTED BY THE USE OF VOICE RECOGNITION AND SYNTHESIS TECHNOLOGY.

DDC: ADA113754  
SOURCE: DTIC  
BIBLIOGRAPHY CITE: SANDRY, D., AND WICKENS, C.D., THE EFFECT OF STIMULUS-CENTRAL PROCESSING-RESPONSE COMPATIBILITY AND RESOURCE COMPETITION ON PILOT PERFORMANCE, EPL-82-1/ONR-82-1, OFFICE OF NAVAL RESEARCH (ONR), ARLINGTON, VA, APRIL 1982

TITLE: WEAPONS' EFFECTS AND TARGET ANALYSIS SIMULATOR, REPORT  
NO.: DTC J-14 TN  
AUTHOR: G. SCHARP  
ORIGINATING ORG: DESERET TEST CENTER(DTC), FORT DOUGLAS, UT  
CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 63/09/01  
COMMENTS: THE WEAPONS EFFECTS AND TARGET ANALYSIS SIMULATOR (WEATAS) MODEL EVALUATES CHEMICAL, BIOLOGICAL, AND FRAGMENTATION WEAPON EFFECTS BASED ON ENVIRONMENTAL CONDITIONS, AGENT DATA, AND TYPE OF WEAPON DELIVERY. THE PROGRAM IS DESIGNED TO BE READILY EXPANDED AND/OR MODIFIED, HAVING A DETAILED SYSTEM DICTIONARY, AND MODULAR PROGRAM STRUCTURE. WRITTEN IN FORTRAN IV AND COBOL.  
DDC: AD500198

TITLE: HUMAN OPERATOR CONTROL STRATEGY MODEL  
AUTHOR: W.E. SEARS, H.F. ENGLER, E.L. DAVENPORT  
ORIGINATING ORG: ENGINEERING EXPERIMENT STATION, GEORGIA INSTITUTE OF TECHNOLOGY, ATLANTA, GA, FOR US AIR FORCE HUMAN RESOURCES LABORATORY (AFHRL), WRIGHT-PATTERSON AFB, OH

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 79/03/01  
COMMENTS: THIS DOCUMENT DISCUSSES THE PROBLEMS OF MODELLING THE HUMAN OPERATOR AND PRESENTS SUCH A MODEL.

TITLE: PHYSIOLOGICAL ASSESSMENT OF GROUND TROOPS UNDER THERMAL STRESS ASSOCIATED WITH DESERT WARFARE  
AUTHOR: Y. SHAPIRO, K.B. PANDOLF, R.F. GOLDMAN  
ORIGINATING ORG: OFFICE OF DEFENSE AND ARMED FORCES ATTACHE, EMBASSY OF ISRAEL, WASHINGTON, DC FOR US ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND, FORT DETRICK, MD

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 80/07/31  
COMMENTS: THIS DOCUMENT IS A COLLECTION OF EXPERIMENTAL PAPERS PERTAINING TO HUMAN TRIALS INVOLVING SEX-RELATED DIFFERENCES IN ACCLIMATION, DEVELOPMENT OF A PREDICTIVE MODEL FOR SWEAT RATE, EFFECT OF SEASONAL VARIATION ON ACCLIMATION, AND MODIFICATION OF A BICYCLE ERGOMETER FOR UNDERWATER USE.

DDC: ADA150990  
SOURCE: DTIC

TITLE: INTEGRATED BATTLEFIELD INTERACTIVE MODEL (INBATIM) PROGRAM DESCRIPTION, PROGRAM MAINTENANCE MANUAL, SMMM-295-85-VOL-1-PART-2  
AUTHOR: J. SHERBY  
ORIGINATING ORG: COMPUTER SCIENCES CORPORATION, FALLS CHURCH, VA, FOR JOINT DATA SYSTEM SUPPORT CENTER, WASHINGTON, DC

CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 85/02/15  
COMMENTS: THIS MAINTENANCE MANUAL DESCRIBES THE PROCEDURES AND REQUIREMENTS FOR MAINTENANCE OF THE INTEGRATED BATTLEFIELD INTERACTIVE MODEL (INBATIM). THE MODEL IS DETERMINISTIC AND SIMULATES CONVENTIONAL AND CHEMICAL WARFARE AT THE THEATER LEVEL. THE MODEL DETERMINES DAILY AND CUMULATIVE LOSSES OF GROUND WEAPONS, AIRCRAFT, AND PERSONNEL BASED ON GROUND AND AIR ATTACKS WITH BOTH CHEMICAL AND CONVENTIONAL WEAPONS.

DDC: ADB092853  
SOURCE: DTIC

TITLE: HUMAN PERFORMANCE IN CONTINUOUS OPERATIONS: DESCRIPTIONS OF A SIMULATION MODEL AND USER'S MANUAL FOR EVALUATION OF PERFORMANCE DEGRADATION, TECH REPORT 505  
AUTHOR: A.I. SIEGEL, J. WOLF, A.M. SCHORN, H. OZKAPTAN  
ORIGINATING ORG: US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES,  
CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 81/01/31  
COMMENTS: THIS DOCUMENT CONTAINS THE INSTRUCTIONS AND REFERENCE TO THE PERFECT COMPUTER PROGRAM WHICH ALLOWS THE ANALYSIS OF ANTICIPATED TROOP PERFORMANCE EFFECTIVENESS. THE MODEL WAS DEVELOPED TO SHOW STRESS INDUCED PERFORMANCE DEGRADATION FROM CONTINUOUS AND NIGHT TIME BATTLE.

TITLE: A REVIEW OF METHODOLOGIES AND CONCEPTS TO MEASURE AND EVALUATE AIRCRAFT SURVIVABILITY/VULNERABILITY,  
JTCG/AS-75-S-002

AUTHOR: R. SMITH, A.S. SOLTES, J.K. WETZEL, L.R. DOYON  
ORIGINATING ORG: JTCG/AS CENTRAL OFFICE, NAVAL AIR SYSTEMS COMMAND, WASHINGTON DC; CONTRACTOR: RAYTHEON COMPANY, SUDBURY, MA

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 78/01/01  
COMMENTS: THIS REPORT IS A SUMMARY OF ALL SIGNIFICANT STUDIES PERFORMED DURING PARTICIPATION IN THE JTCG/AS TEAS PROGRAM. THE STUDIES ENCOMPASS PRIMARILY THREE AREAS: SURVIVABILITY ASSESSMENT MODELING, MISSION COST-EFFECTIVENESS METHODOLOGY, AND SURVIVABILITY ASSESSMENT STUDIES. IN THE SURVIVABILITY ASSESSMENT MODELING AREA, SEVERAL AIRCRAFT ATTRITION MODELS WERE EVALUATED TO DETERMINE THEIR APPLICABILITY TO THE TEAS EFFORT, AND MODELING DEFICIENCIES WERE IDENTIFIED. ATTRITION MODELING REQUIREMENTS WERE OUTLINED TO ESTABLISH A MORE EFFECTIVE BASELINE MODEL, AND MODELING VALIDATION TECHNIQUES WERE STUDIED TO ESTABLISH MODEL CREDIBILITY. A MISSION COST-EFFECTIVENESS METHODOLOGY IS DESCRIBED TO ASSIST THE SURVIVABILITY ASSESSMENT SUBGROUP IN THE EVALUATION OF THE BASELINE AIRCRAFT. FOLLOWING THE DEFINITION OF A GENERALIZED MISSION EFFECTIVENESS/SURVIVABILITY MODEL, A COST MODEL BASED ON THE WESIAC METHOD WAS OUTLINED AND A SAMPLE PROBLEM WAS DESCRIBED TO DEMONSTRATE A TYPICAL APPLICATION TO THE TEAS PROGRAM. FINALLY, SURVIVABILITY ASSESSMENT STUDIES WERE PERFORMED TO PROVIDE EXAMPLES OF HOW CURRENT SURVIVABILITY METHODOLOGIES COULD BE APPLIED TO THE STUDY OF AIRCRAFT ATTRITION.

DOC: ADA050152

TITLE: TASK-ELEMENT AND INDIVIDUAL DIFFERENCES IN PROCEDURAL LEARNING AND RETENTION, ARI-RN-84-1  
AUTHOR: P.J. STICHA, C.M. KNERR  
ORIGINATING ORG: DECISIONS AND DESIGNS INCORPORATED, MCLEAN VA FOR US ARMY RESEARCH INSTITUTE, FORT KNOX, KY

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE:  
COMMENTS:

84/C1/01  
THE RATE AT WHICH PERFORMANCE IMPROVES DURING TRAINING, AND THE EXTENT TO WHICH INFORMATION IS RETAINED DURING INTERVALS WITHOUT PRACTICE, IS A CONCERN OF THOSE WHO PLAN AND MANAGE MILITARY TRAINING. THIS REPORT ILLUSTRATES THE APPLICATION OF MATHEMATICAL MODELS TO INVESTIGATE ISSUES REGARDING ACQUISITION OF COMPLEX MILITARY SKILLS. THE PURPOSE OF THIS REPORT WAS TO TEST A MODEL OF LEARNING AND RETENTION OF ARMOR PROCEDURES.

DDC:

ADA136789

TITLE: A MATHEMATICAL MODEL OF PHYSIOLOGICAL TEMPERATURE REGULATION IN MAN, NASA-CR-1855

AUTHOR:  
ORIGINATING ORG:

J.A.J. STOLWIJK  
YALE UNIVERSITY SCHOOL OF MEDICINE, NEW HAVEN, CO FOR NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA), WASHINGTON, DC

CLASSIFICATION:  
DOCUMENT DATE:  
COMMENTS:

UNCLASSIFIED  
71/08/01  
THIS REPORT DISCUSSES A DYNAMIC MATHEMATICAL MODEL OF PHYSIOLOGICAL REGULATION OF BODY TEMPERATURE IN MAN, WHICH USES 25 NODES TO REPRESENT THE THERMAL CHARACTERISTICS OF THE BODY, EACH HAVING THE APPROPRIATE METABOLIC HEAT PRODUCTION, CONVECTIVE HEAT EXCHANGE WITH THE CENTRAL BLOOD COMPARTMENTS. SIMULATIONS OF EXPERIMENTAL EXPOSURES TO STEP CHANGES IN ENVIRONMENTAL TEMPERATURE AT REST AND OF 30 MINUTE EXERCISE BOUTS AT 25, 50 AND 75 PERCENT OF MAXIMUM AEROBIC CAPACITY AT DIFFERENT AMBIENT TEMPERATURES ARE COMPARED WITH ACTUAL RESULTS. DOCUMENTED FORTRAN PROGRAM IS INCLUDED.

SOURCE:  
BIBLIOGRAPHY CITE:

NTIS, N7133401  
STOLWIJK, J.A.J., A MATHEMATICAL MODEL OF PHYSIOLOGICAL TEMPERATURE REGULATION IN MAN, NASA-CR-1855, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA), WASHINGTON, DC, AUGUST 1971

TITLE:  
AUTHOR:  
ORIGINATING ORG:  
CLASSIFICATION:  
DOCUMENT DATE:  
COMMENTS:

BATTLE SIMULATION FOR COMMAND AND CONTROL TRAINING,  
RAND/P-6769  
R. STRAUCH  
THE RAND CORPORATION, SANTA MONICA, CA  
UNCLASSIFIED  
82/06/01  
THIS PAPER PRESENTS THE AUTHOR'S VIEWS ON THE DEVELOPMENT OF TACTICAL FORCE MANAGEMENT TRAINING AND ANALYSIS FACILITY (TFMTAF). THE AUTHOR CLAIMS THAT CURRENT COMPUTERIZED COMBAT MODELS ARE INADEQUATE. HE SUGGESTS THAT A HYBRID MODEL COUPLING A HUMAN CONTROL

TEAM WITH A COMPUTER DATA BASE SYSTEM BE USED IN THE  
TFMTAF.

DDC:  
ADA146246

TITLE: FACILITY OPERABILITY: ONE ASPECT OF ASSESSING AIRBASE  
WARTIME CAPABILITY, LSSR-81-82

AUTHOR: G.R. SUNADA  
ORIGINATING ORG: AIR FORCE INSTITUTE OF TECHNOLOGY (AFIT),  
WRIGHT-PATTERSON AFB, OH

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 82/09/01

COMMENTS: FACILITY OPERABILITY IS DEFINED AS THE OPERATING  
CAPABILITY OF FACILITIES AS THEY RELATE TO THE  
MILITARY MISSION OF AN AIR BASE. A MODEL FACILITY  
OPERABILITY MEASUREMENT SYSTEM IS DEVELOPED. THIS  
STUDY SOUGHT TO: 1) DEVELOP THE CONCEPT THAT  
FACILITIES AFFECT AIR BASE CAPABILITY AND READINESS,  
2) DETERMINE GOALS, OBJECTIVES, AND CRITERIA FOR  
DEVELOPING A SYSTEM TO MEASURE CAPABILITY AND  
READINESS OF FACILITIES, AND 3) PROPOSE A MODEL SYSTEM  
FOR ASSESSING CAPABILITY AND READINESS OF FACILITIES  
AS THEY RELATE TO THE MILITARY MISSION OF AN AIR BASE.  
THE AUTHOR SUGGESTS USING THIS MEASUREMENT SYSTEM IN  
CONJUNCTION WITH COMBAT SIMULATION SYSTEMS. CONTAINS A  
COMPENDIUM OF OPERABILITY RELATED TERMS.

DDC:  
ADA123741  
SOURCE: DTIC

TITLE: AIRBASE OPERATIONS IN A CHEMICAL ENVIRONMENT,  
AFIT/GST/OS/82M-14

AUTHOR: R.E. TAFT  
ORIGINATING ORG: AIR FORCE INSTITUTE OF TECHNOLOGY, WRIGHT-PATTERSON  
AFB, OH

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 82/03/01

COMMENTS: THIS IS A THESIS OF THE EFFECTS OF MAINTENANCE  
OPERATIONS ON A FIGHTER BASE IN A CHEMICAL  
ENVIRONMENT. THE GOAL WAS TO DETERMINE IF CURRENT  
MANNING FOR FLIGHT LINE MAINTENANCE IS SUFFICIENT TO  
SUPPORT AIR OPERATIONS. RESULTS INDICATE A NEED FOR A  
25 PERCENT INCREASE IN MANNING FROM TODAY'S LEVEL.  
Q-GERT WAS THE BASIS FOR THE MODEL WITH SUPPORT FROM  
16 USER SUBROUTINES.

DDC:  
ADA115685

TITLE: CORDIVEM EUROPEAN TERRAIN DATA, CAORA/TP-2-83

AUTHOR: W.J. THOMSON  
ORIGINATING ORG: US ARMY COMBINED ARMS OPERATIONS RESEARCH ACTIVITY  
(CAORA), FORT LEAVENWORTH, KS

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 83/01/01  
COMMENTS: DESCRIPTION OF DATA SOURCES AND THE METHODS USED TO DEVELOP A CORPS-SIZED EUROPEAN TERRAIN DATA BASE FOR THE CORPS/DIVISION EVALUATION MODEL (CORDIVEM). THE OPERATIONAL DATA REQUIREMENTS USE HEXAGONAL CELLS OF TERRAIN DATA OF THE FULDA GAP, GERMANY, AND THE DISPLAY DATA USES GRAFTEND DATA AND SOFTWARE FROM THE CORPS BATTLE GAME EFFORT. PRESENTS SHORT METHOD OF DEVELOPMENT, APPENDIX A: DATA STRUCTURES AND ACCESS METHODS, APPENDIX B. : SOFTWARE PROGRAMS AND APPENDIX C: HEX DATA IN ICOR.

DDC: ADA132940  
SOURCE: DTIC

TITLE: CLASSIFIED TITLE CDE-TN-370  
AUTHOR: B.B. THURSTON, P.L. EVANS  
ORIGINATING ORG: CHEMICAL DEFENCE ESTABLISHMENT(CDE), ENGLAND  
CLASSIFICATION: CONFIDENTIAL  
DOCUMENT DATE: 78/12/01  
COMMENTS: DESCRIBES THE DEGRADATION OF SORTIE GENERATION RATE DUE TO ATTACKS BY CHEMICAL WEAPONS. THE MODEL IS A VERY SIMPLE QUEUING MODEL USING NUMBER OF AIRCRAFT, NUMBER OF TURNAROUND TEAMS, OPERATIONAL TURNAROUND TIME, AND MEAN FLYING TIME AS INPUTS. THE MODEL IS A SINGLE QUEUE MULTIPLE SERVER TYPE. THE MODEL WAS USED TO EXAMINE DEGRADATION DUE TO CHEMICAL ATTACK. THE ATTACK WAS MODELED BY REDUCING THE NUMBER OF TURNAROUND TEAMS AND INCREASING THE MEAN TURNAROUND TIME. THE PAPER CONCLUDES THAT TRAINED AND PROTECTED GROUND CREWS CAN OPERATE IN A CHEMICAL ENVIRONMENT WITH LITTLE DEGRADATION IN SORTIE RATE.

TITLE: CONTROL THEORETIC MODELLING OF THE HUMAN PROCESS  
AUTHOR: OPERATOR, REPORT 55  
ORIGINATING ORG: J. TIMONEN  
CLASSIFICATION: TECHNICAL RESEARCH CENTRE OF FINLAND, ESPOO, FINLAND  
DOCUMENT DATE: UNCLASSIFIED  
COMMENTS: 80/11/01  
THIS DOCUMENT DISCUSSES VARIOUS MATHEMATICAL METHODS TO MODEL THE HUMAN INSTRUMENT MONITOR AND CONTROLLER. VARIOUS HUMAN FACTOR CONSIDERATIONS AND HUMAN DECISION MAKING PROCESSES ARE ALSO INCLUDED.

TITLE: ADAPTIVE MODELING AND REAL-TIME SIMULATION,  
AUTHOR: TRDC-TR-83-308  
ORIGINATING ORG: W.M. TYSON  
SRI INTERNATIONAL, MENLO PARK, CA FOR ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB, NY

CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 84/01/01  
COMMENTS: REPORT ON AN EFFORT TO DEVISE AN ADAPTIVE MODELING APPROACH TO REAL-TIME DECISION MAKING IN A MISSION PLANNING APPLICATION. METHOD USES PREDICATE CALCULUS AND INVOLVES PROLOG TYPE GOAL ORIENTED PROGRAMMING. A FORMAL MODEL OF THE LOGIC SYSTEM IS PRESENTED.

DDC: ADA141648

TITLE: A MODEL TO CALCULATE HOURLY TEMPERATURE FROM THREE REGULAR READINGS, PART III  
AUTHOR: A.F.V. VANENGELEN, H.A.M. GEURTS  
ORIGINATING ORG: ROYAL NETHERLANDS METEOROLOGY INSTITUTE, DE BILT, NETHERLANDS  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 83/08/01  
COMMENTS: THIS REPORT PRESENTS A MODEL CAPABLE OF CALCULATING THE TEMPERATURES FOR EVERY HOUR OF A GIVEN DAY FROM A SMALL NUMBER OF REGULAR READINGS EACH DAY. THE MODEL MAKES IT POSSIBLE TO CALCULATE MEAN DAILY TEMPERATURES AND TO EXPRESS A REGULAR TEMPERATURE READING AT ANY HOUR OF THE DAY IN TERMS OF READINGS FROM OTHER HOURS OF THE SAME DAY.

TITLE: HUMAN FACTORS IN TACTICAL NUCLEAR COMBAT  
AUTHOR: R. VINEBERG  
ORIGINATING ORG: THE GEORGE WASHINGTON UNIVERSITY, HUMAN RESOURCES RESEARCH OFFICE, FOR THE DEPARTMENT OF THE ARMY, WASHINGTON DC  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 65/01/27  
COMMENTS: THIS IS AN EXECUTIVE SUMMARY OF A BRIEFING DEALING WITH PSYCHOLOGICAL EFFECTS OF MASS CASUALTIES. THIS IS A REPORT OF A MODEL DEVELOPED USING WWII DATA TO PREDICT PSYCHOLOGICAL CASUALTIES. DETAILS ON THE MODEL ARE NOT GIVEN.  
DDC: AD647838

TITLE: KNOWLEDGE BASE MANAGEMENT FOR MODEL MANAGEMENT SYSTEMS  
AUTHOR: G.W. WATSON  
ORIGINATING ORG: NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 83/06/01  
COMMENTS: THIS STUDY EXAMINES THE ISSUES INVOLVED IN BRINGING QUALITATIVE AND QUANTITATIVE TECHNIQUES TO BEAR UPON UNSTRUCTURED MANAGERIAL DECISIONS AND ATTEMPTS TO:  
1) IDENTIFY REQUIREMENTS AND CHALLENGES FACED BY IMPLEMENTOR OF A DECISION SUPPORT SYSTEM, 2) IDENTIFY

AREA' OF ARTIFICIAL INTELLIGENCE WHICH COULD BE HELPFUL IN MODELING DECISION MAKING, 3) SHOW HOW MODEL ABSTRACTIONS CAN BE EXTENDED TO CONCEPT OF FRAMES, 4) IMPLEMENT A SIMPLIOTIC FRAME SYSTEM AS THE BASIS OF A MODEL MANAGEMENT SCHEME.

DDC: ADA132211

TITLE: THE EFFECT OF VISUAL INFORMATION ON THE MANUAL APPROACH AND LANDING, NLR MP 80019 U  
AUTHOR: P.H. WEWERINKE  
ORIGINATING ORG: NATIONAL AEROSPACE LABORATORY (NLR), AMSTERDAM, THE NETHERLANDS  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 80/04/28  
COMMENTS: THIS DOCUMENT DESCRIBES A MODEL ANALYSIS WHICH PREDICTS THE EFFECTS OF A VARIETY OF CONDITIONS ON MANUAL AIRCRAFT APPROACH PERFORMANCE. THE MODEL RESULTS ARE THEN COMPARED WITH EXPERIMENTAL RESULTS FROM SIMULATED CONDITIONS. IT IS SUGGESTED THAT THE MODEL HAS USEFUL PREDICTIVE CAPABILITY FOR THE EFFECTS OF THE VISUAL PERCEPTION PROCESSES INVOLVED IN A COMPLEX MANUAL APPROACH TASK.

TITLE: ATTENTIONAL RESOURCE ALLOCATION IN A VARIABLE DIFFICULTY DUAL TASK PARADIGM, AFOSR-77-3380  
AUTHOR: C.D. WICKENS, B. PIERCE  
ORIGINATING ORG: UNIVERSITY OF ILLINOIS, CHAMPAIGN, IL FOR AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR), WASHINGTON, DC  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 77/02/01  
COMMENTS: THIS STUDY SEEKS TO DESCRIBE AND EVALUATE THE HUMAN ATTENTION ALLOCATION SYSTEM (AAS) BY USING LINEAR FEEDBACK CONTROL THEORY TO MODEL DUAL TASK PERFORMANCE IN VARIABLE DIFFICULTY CONDITIONS. EIGHT SUBJECTS PERFORMED TWO CONCURRENT TRACKING TASKS, ONE OF PRIMARY AND ONE OF SECONDARY IMPORTANCE. THE DIFFICULTY OF THE PRIMARY TASK IS VARIED IN A SEMI-PERIODIC FASHION FEEDBACK ON HOW THE SUBJECT WAS PERFORMING WAS GIVEN HALF THE TIME. SEVERAL CONCLUSIONS WERE DRAWN: THIS STUDY SUPPORTS THE THEORY THAT AN AAS CAN BE MODELED WITH LINEAR CONTROL THEORY; PRIMARY TASK PERFORMANCE WAS HIGHLY SENSITIVE TO PRIMARY TASK DIFFICULTY INDICATING THAT SUBJECTS COULD NOT OPTIMALLY ALLOCATE RESOURCES FROM THE SECONDARY TO THE PRIMARY TASK; AND THE FEEDBACK DISPLAY SEEMED TO ACT AS A DISTRACTING THIRD TASK THAT DIVERTED RESOURCES FROM THE SECONDARY TASK.

DDC: ADA059463  
SOURCE: DTIC

BIBLIOGRAPHY CITE: WICKENS, C.D. AND PIERCE, B., ATTENTIONAL RESOURCE ALLOCATION IN A VARIABLE DIFFICULTY DUAL TASK PARADIGM, AFOSR-77-3380, AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR), WASHINGTON, DC, FEBRUARY 1977

TITLE: A MATHEMATICAL MODEL OF THE HUMAN THERMAL SYSTEM  
AUTHOR: E.H. WISSLER  
ORIGINATING ORG: THE DEPARTMENT OF PHYSICS, UNIVERSITY OF TEXAS, AUSTIN, TX FOR US ARMY OFFICE OF THE SURGEON GENERAL, WASHINGTON, DC  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 64/01/01  
COMMENTS: A MATHEMATICAL MODEL DEVELOPED TO SIMULATE THE PHYSICAL CHARACTERISTICS OF THE HUMAN THERMAL SYSTEM DYNAMICALLY USING LOCAL METABOLIC HEAT GENERATION RATES, LOCAL BLOOD FLOW RATES, AND SEAT RATES AS INPUT DATA. FIFTEEN GEOMETRIC REGIONS WERE MODELED. MODEL VALIDATION AGAINST EXPERIMENTAL DATA WAS COLLECTED.

TITLE: PREDICTION OF AIRCREW PERFORMANCE UNDER DIFFERENT ENVIRONMENTAL CONDITIONS  
AUTHOR: E.H. WISSLER, S.A. MUNNELEY  
ORIGINATING ORG: SOCIETY OF AUTOMOTIVE ENGINEERS (SAE), WARRENDALE, PA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 84/07/19  
COMMENTS: THE AUTHORS DESCRIBE A COMPUTER MODEL WHICH THEY CLAIM IS ABLE TO ACCURATELY PREDICT HUMAN THERMAL RESPONSES OVER A WIDE RANGE OF CONDITIONS. NO EQUATIONS OR DERIVATIONS ARE PROVIDED. THREE SIMULATIONS USING THE MODEL ARE SUMMARIZED. THIS DOCUMENT CONTAINS AN EXCELLENT BIBLIOGRAPHY FOR RESEARCHING HEAT STRESS MODELING.

TITLE: STEADY-STATE TEMPERATURE DISTRIBUTION IN MAN  
AUTHOR: E.H. WISSLER  
ORIGINATING ORG: DEPARTMENT OF CHEMISTRY, UNIVERSITY OF TEXAS, AUSTIN, TX FOR US ARMY OFFICE OF THE SURGEON GENERAL, WASHINGTON, DC  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 60/08/01  
COMMENTS: A SIX SEGMENT MODEL OF HEAT TRANSPORT WAS MADE TO STUDY HEAT FLOW. DATA FOR BASAL MAN AND THE THERMAL BALANCE EQUATIONS WERE GIVEN.

TITLE: TOWARD A UNIFIED APPROACH TO COMBAT SYSTEM ANALYSIS, TR-151

AUTHOR: J.G. WOHL, E.E. ENTIN, M.G. ALEXANDRIDIS, J.S. ETERNO  
ORIGINATING ORG: ALPHATECH, INC., BURLINGTON, MA FOR OFFICE OF NAVAL  
RESEARCH, ARLINGTON, VA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 83/01/01  
COMMENTS: IN THE REVIEW OF DISTRIBUTED C CUBED SYSTEMS, SYSTEMS  
EFFECTIVENESS PARADIGMS FOR EVALUATIONS WILL HAVE TO  
DEAL WITH HIGH COMPLEXITY AND CONNECTIVITY. TWO  
METHODOLOGIES TO APPROACH SYSTEMS EFFECTIVENESS  
MEASURES WOULD BE TO USE A STATIC FUNCTIONAL  
DECOMPOSITION METHODOLOGY SUCH AS IDEF AND A NETWORK  
SIMULATION MODEL SUCH AS SAINT. THE SECOND METHODOLOGY  
USES AN EXPERT SYSTEMS APPROACH TO EVALUATE THE FACETS  
OF THE SYSTEM SUCH AS THE SHOR PARADIGM TO REPRESENT  
HUMAN DECISION-MAKING. THE APPLICATION OF THE SHOR  
PARADIGM TO AN ANTISUBMARINE WARFARE APPLICATION WAS  
DISCUSSED.  
DDC: ADA124570

TITLE: A PERSISTENT CHEMICAL EFFECTS MODEL  
AUTHOR: M.A. YOUNGREN  
ORIGINATING ORG: NAVAL POST GRADUATE SCHOOL, MONTEREY, CA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 83/06/01  
COMMENTS: A THESIS THAT PRESENTS A HIGH RESOLUTION STOCHASTIC  
COMBAT SIMULATION MODEL THAT SIMULATES THE EFFECTS OF  
A PERSISTENT CHEMICAL AGENT ATTACK ON A GROUND FORCE  
UNIT. MODEL SIMULATES THE MEASURES TAKEN BY A SOLDIER  
(ANTIDOTE, DECONTAMINATION, MASKING, FIRST AID, AND  
ENSEMBLE DONNING) IN RESPONSE TO A DIRECT OR INDIRECT  
CHEMICAL THREAT. THREAT IS PROVIDED BY A NUSSE II  
DEPOSITION AND CONCENTRATION GRID. DOSAGES ARE  
COMPUTED FOR MULTIPLE AGENTS AND MULTIPLE ROUTES OF  
ENTRY BUT WITH NO INTERACTION. MODEL ACTIONS ARE  
PERFORMED IN RESPONSE TO PROBABILITY DISTRIBUTIONS.  
MODEL IS IMPLEMENTED IN SIMSCRIPT. NO INPUT DATA OR  
SAMPLE OUTPUT IS PROVIDED. MODEL USES VERY SIMPLE  
METHODOLOGY.  
BIBLIOGRAPHY: AAMRL-TR-87-006  
DDC: ADA132126  
BIBLIOGRAPHY CITE: YOUNGREN, M.A., A PERSISTENT CHEMICAL EFFECTS MODEL,  
NAVAL POST GRADUATE SCHOOL, MONTEREY, CA, JUNE 1983

TITLE: SHELTER VENTILATION KINETICS MODEL AND PROGRAM  
ORIGINATING ORG: ARMAMENT SYSTEMS, INC., ANAHEIM, CA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 83/05/01  
COMMENTS: THIS REPORT DESCRIBES A MODEL DEVELOPED TO SIMULATE  
THE CHANGES IN CONCENTRATION AND DOSAGE OF A CHEMICAL  
AGENT AS A FUNCTION OF TIME INSIDE A PROTECTIVE

STRUCTURE SUBJECTED TO CHEMICAL AND CONVENTIONAL ATTACK. THE EQUATIONS AND METHODOLOGY ACCOUNT FOR THE ENTRY OF AN AGENT INTO THE STRUCTURE'S ATMOSPHERE THROUGH LEAKAGE OF CONTAMINATED AIR FROM THE OUTSIDE AND THROUGH EVAPORATION FROM CONTAMINATED SURFACES INSIDE THE STRUCTURE. THE ELIMINATION OF AN AGENT THROUGH LEAKAGE AND THROUGH OUTLET VENTS IS ALSO ACCOUNTED FOR. THIS MODEL IS INTENDED FOR APPLICATION TO CHEMICAL PROTECTIVE SHELTERS WITH FILTERED AIR SUPPLIES. THE FORTRAN SOURCE LISTING IS INCLUDED.

TITLE:

PRELIMINARY DESIGN AND RESOURCE ESTIMATE FOR COMBINED ARMS SIMULATION MODEL (CASM), APPENDIX TO VOL IV, MILITARY OPERATIONAL DESCRIPTIONS

ORIGINATING ORG:  
CLASSIFICATION:  
DOCUMENT DATE:  
COMMENTS:

THE BDM CORP., VA

SECRET

76/03/17

THIS REPORT IS THE CLASSIFIED APPENDIX TO VOLUME IV ON THE PRELIMINARY DESIGN AND RESOURCE ESTIMATE FOR THE COMBINED ARMS SIMULATION MODEL (CASM). CASM IS PROPOSED TO BE A LARGE THEATER-LEVEL SIMULATION MODEL LOOKING AT AIR AND GROUND INTERACTIONS WITH EXPLICIT TREATMENT OF COMMAND AND CONTROLS PROCESSES APPENDIX DISCUSSES THE FOLLOWING: SOVIET GROUND TACTICAL DOCTRINE, SOVIET AIR TACTICAL DOCTRINE, GROUND AND AIR STRATEGY AND DOCTRINE, NATO COMMAND, CONTROL AND COMMUNICATIONS STRUCTURE, AND WARSAW PACT COMMAND, CONTROL AND COMMUNICATIONS STRUCTURE.

DDC:

ADC005731

TITLE:

CHEMICAL DEFENSE PLANNING DOCUMENT (CDPD), VOLUME IV: ANALYSIS OF EFFECTS OF CWD CAPABILITIES ON AIR BASE OPERATIONS IN THE 1990 TIMEFRAME

CLASSIFICATION:  
DOCUMENT DATE:  
COMMENTS:

ORIGINATING ORG:SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC), DAYTON, OH FOR AERONAUTICAL SYSTEM DIVISION (ASD), WRIGHT-PATTERSON AFB, OH

SECRET

85/05/10

THIS DOCUMENT PRODUCED UNDER THE AIR FORCE'S LONG RANGE CHEMICAL DEFENSE DEVELOPMENT PLAN (LRCDDP) EFFORT IS INTENDED AS THE BASIS FOR A PLAN TO DEVELOP AN INTEGRATED AIR BASE CHEMICAL DEFENSE SYSTEM THAT WILL MEET THE MISSION CAPABILITY REQUIREMENTS FOR THE 1990'S. THIS VOLUME, FOURTH OF FIVE, CONTAINS AN ANALYSIS OF USAF CURRENT AND PLANNED CHEMICAL WARFARE DEFENSE CAPABILITIES IN VIEW OF PROJECT 1990 CW REQUIREMENTS. IT IDENTIFIES THE DEFICIENCIES EXPECTED IN EACH OF FOUR FUNCTIONAL AREAS AND ASSESSES THEIR IMPACT ON AIR BASE OPERATIONS, I.E., SORTIE

GENERATION. THE AIR BASE COMPUTER MODEL WAS USED TO SIMULATE AIR BASE OPERATIONS.

TITLE: CW DATA BASE INPUT TO TAC WARRIOR, ANNEX TO FINAL REPORT, EAI 81-0002  
ORIGINATING ORG: EAI CORP., FREDERICK, MD  
CLASSIFICATION: SECRET  
DOCUMENT DATE: 80/12/15  
COMMENTS: ANNEX TO (I24-1048), CONTAINS THE FOLLOWING: 1. ADDITIONAL CASUALTY DATA FOR SOVIET AIR BASE PERSONNEL AND 2. LCOM MODEL DATA EXTRACTED FROM THE STUDY, "AN ANALYTIC TECHNIQUE FOR EVALUATING THE STATE OF READINESS OF THE SOVIET AIR FORCE TO OPERATE IN A CHEMICAL WARFARE ENVIRONMENT," BY GROMET, INC., 1976.

TITLE: CATALOG OF WAR GAMING MODELS 3RD EDITION  
ORIGINATING ORG: JOINT WAR GAMES AGENCY, WASHINGTON, DC  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 68/01/02  
COMMENTS: THIS CATALOG WAS PREPARED FOR PROVIDING MEMBERS OF THE JOINT STAFF, THE UNIFIED AND SPECIFIED COMMANDS AND THE SERVICES, WHO ARE INVOLVED IN WAR GAMING ACTIVITIES, WITH A SINGLE SOURCE DOCUMENT WHICH LISTS AND BRIEFLY DESCRIBES ALL AVAILABLE WAR GAME MODELS. IT WAS NOT DESIGNED TO PROVIDE A DETAILED TREATMENT OF EACH MODEL, BUT TO PROVIDE ONLY SUFFICIENT INFORMATION TO ASSIST THE WAR GAMER IN HIS PRELIMINARY RESEARCH.  
DDC: AD826153

TITLE: ASSESSMENT OF THE PERFORMANCE OF AN IN-FIELD GAUSSIAN PLUME/PUFF MODEL FOR OVERWATER USE, NPS-61-85-002  
AUTHOR: C.E. SKUPNIEWICZ, G.E. SCHACHER  
ORIGINATING ORG: NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 84/11/01  
COMMENTS: THIS REPORT DESCRIBES THE DEVELOPMENT OF THE SHIPBOARD NUMERICAL AIDS PROGRAM (SNAP). THE PROGRAM IS DESIGNED TO PREDICT CHEMICAL HAZARD OVER A BODY OF WATER. SNAP USES A SIMPLE GAUSSIAN PLUME MODEL WITH A SINGLE PUFF-SOURCE. IT IS WRITTEN IN BASIC AND RUNS ON AN HP9845B MICRO-COMPUTER - RUN TIME IS APPROXIMATELY 10 SECONDS. THE PROGRAM OUTPUT IS A POLAR COORDINATE PLOT SHOWING LD50 (LETHAL DOSAGE AT WHICH 50 PERCENT OF THE POPULATION IS AFFECTED) AND LD1 ISOPLETHS. SNAP IS BEING DEVELOPED BY THE US NAVY.  
DDC: ADA160032  
SOURCE: DTIC  
BIBLIOGRAPHY CITE: SKUPNIEWICZ, C.E., AND SCHACHER, G.E., ASSESSMENT OF

THE PERFORMANCE OF AN IN-FIELD GAUSSIAN PLUME/PUFF MODEL FOR OVERWATER USE, NPS-61-85-002, NAVAL POSTGRADUATE SCHOOL (NPS), MONTEREY, CA, NOVEMBER 1984.

TITLE: COMPUTER ENGAGEMENT MODEL SURVEY FOR CHEMICAL WARFARE MODELING

ORIGINATING ORG: QUEST RESEARCH CORPORATION, MCLEAN, VA, FOR US AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY (AFAMRL), WRIGHT-PATTERSON AFB, OH

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 78/10/30

COMMENTS: THIS REPORT DOCUMENTS THE SURVEY OF COMPUTER ENGAGEMENT MODELS BY QUEST RESEARCH CORPORATION FOR THE AEROSPACE MEDICAL RESEARCH LABORATORY. THE FOCUS OF THE SURVEY WAS ON MODELS WHICH COULD BE USED TO ANALYZE THE IMPACT OF CHEMICAL WARFARE ON PILOT PERFORMANCE. A BRIEF DESCRIPTION OF EACH MODEL SURVEYED IS INCLUDED.

TITLE: ENGAGEMENT MODELING EVALUATION

ORIGINATING ORG: QUEST RESEARCH CORP., MCLEAN, VA FOR AFAMRL/HE, WRIGHT-PATTERSON AFB OH

CLASSIFICATION: UNCLASSIFIED

DOCUMENT DATE: 79/06/26

COMMENTS: THIS DOCUMENT PRESENTS AN OVERVIEW OF THE MOST SIGNIFICANT AIR FORCE MISSION EFFECTIVENESS MODELS. THE THRUST OF THE REPORT IS AN EVALUATION OF THE MODELS AND PROPOSED HIERARCHIES FOR USE IN A CHEMICAL WARFARE CREW PERFORMANCE ANALYSIS. THEATER LEVEL MODELS, SUCH AS TACWAR, ARE DISCUSSED BRIEFLY. MOST OF THE REMAINING MODELS ARE SUBDIVIDED INTO AIR-TO-GROUND AND AIR-TO-AIR MODELS. OTHER RELATED MODELS, SUCH AEP, ARE ALSO TREATED. THE PRIMARY AIR-TO-GROUND MODEL WAS FOUND TO BE TAGSEM II, WHILE THE MAIN AIR-TO-AIR MODELS WERE DETERMINED TO BE SAAB, PACAM V, AND TAC AVENGER. TAVDS, A WEAPONS DELIVERY MODEL, IS USED FOR BOTH AIR-TO-GROUND AND AIR-TO-AIR SIMULATION. THE AIR-TO-AIR MODELS WERE CLAIMED TO BE NOT AS READY AS TAGSEM TO INCORPORATE MODELLING OF CHEMICAL EFFECTS, BUT UPDATES WERE SAID TO BE FORTH-COMING. FOR EXAMPLE, TAC BRAWLER WAS EXPECTED TO REPLACE TAC AVENGER. SINCE THIS REPORT, PACAM V HAS BEEN REPLACED BY PACAM 8. THIS DOCUMENT IS RECOMMENDED READING AS AN INTRODUCTION TO MISSION EFFECTIVENESS MODELLING.

TITLE: CHEMICAL DEFENSE PLANNING DOCUMENT (CDPD), VOLUME IV:

ORIGINATING ORG: ANALYSIS OF EFFECTS OF CWD CAPABILITIES ON AIR BASE OPERATIONS IN THE 1990 TIMEFRAME  
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION  
(SAIC), DAYTON, OH FOR AERONAUTICAL SYSTEM DIVISION  
(ASD), WRIGHT-PATTERSON AFB, OH

CLASSIFICATION: SECRET  
DOCUMENT DATE: 85/05/10  
COMMENTS: THIS DOCUMENT PRODUCED UNDER THE AIR FORCE'S LONG RANGE CHEMICAL DEFENSE DEVELOPMENT PLAN (LRCDDP) EFFORT IS INTENDED AS THE BASIS FOR A PLAN TO DEVELOP AN INTEGRATED AIR BASE CHEMICAL DEFENSE SYSTEM THAT WILL MEET THE MISSION CAPABILITY REQUIREMENTS FOR THE 1990'S. THIS VOLUME, FOURTH OF FIVE, CONTAINS AN ANALYSIS OF USAF CURRENT AND PLANNED CHEMICAL WARFARE DEFENSE CAPABILITIES IN VIEW OF PROJECT 1990 CW REQUIREMENTS. IT IDENTIFIES THE DEFICIENCIES EXPECTED IN EACH OF FOUR FUNCTIONAL AREAS AND ASSESSES THEIR IMPACT ON AIR BASE OPERATIONS, I.E., SORTIE GENERATION. THE AIR BASE COMPUTER MODEL WAS USED TO SIMULATE AIR BASE OPERATIONS.

TITLE: CASUALTY RATE ASSESSMENT, PROJECT CARAMU  
ORIGINATING ORG: THE TRUSTEES OF THE UNIVERSITY OF PENNSYLVANIA  
CLASSIFICATION: UNCLASSIFIED  
DOCUMENT DATE: 59/08/31  
COMMENTS: THIS DOCUMENT DESCRIBES AN ANALYTICAL MODEL DEVELOPED IN THE LATE 1950'S TO PREDICT EXPECTED CASUALTY RATES FROM TOXIC WEAPONS. FOUR PRIMARY AREAS ARE TREATED BY THE METHOD: (1) THE BREATHING FUNCTION, (2) THE CONCENTRATION OF TOXIC VAPOR, (3) THE LOCATION OF MUNITION IMPACT POINTS, AND (4) THE DOSE-RESPONSE CURVE FOR THE TOXIC AGENT.

DDC: AD318280

TITLE: A WORK PROGRAM FOR A BCW SIMULATION MODEL  
ORIGINATING ORG: US NAVAL WEAPONS LABORATORY, DAHLGREN, VA;  
CLASSIFICATION: UNCLASSIFIED/LIMITED  
DOCUMENT DATE: 63/03/01  
COMMENTS: THIS REPORT CONTAINS A DISCUSSION OF THE DESIRED END PRODUCTS OF THE OPERATING BCW PROGRAM AND OF A SENSITIVITY STUDY WHICH WOULD CONSTRUCT LIMITED SET APPROXIMATIONS OF THE REAL WORLD. BCW IS AN EXTENSION OF THE CALDER MODEL, AND WAS TO BE MEASURED AGAINST THAT MODEL. THE RECOMMENDED APPROACH TO THE SENSITIVITY ANALYSIS WAS A MODIFIED SEQUENTIAL, OR "LEARNING" APPROACH, CONCENTRATING ON THOSE AREAS OF GREATEST INTEREST.

DDC: AD820108